



IDRC-TS27e

# **Science and Technology for Development**

## **Policy Instruments to Define the Pattern of Demand for Technology**

**STPI Module 7**

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for Development

STPI MODULE 7: POLICY INSTRUMENTS TO DEFINE THE PATTERN  
OF DEMAND FOR TECHNOLOGY

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## FOREWORD

This module constitutes an integral part of the Main Comparative Report of the Science and Technology Policy Instruments (STPI) project, a large research effort that examines the design and implementation of science and technology policies in 10 developing countries (Appendixes 1 and 2).

The STPI project generated a large number of reports, essays, and monographs covering a great variety of themes in science and technology for development. More than 250 documents were produced by the country teams and the Field Coordinator's Office, and this proliferation posed rather difficult problems during the comparative phase of the project. It was decided that a Main Comparative Report, covering the substantive aspects of the research work of the country teams would be published, and that several monographs treating specific subjects would complement it.

The Main Comparative Report is organized in three parts. The first consists of a short essay covering the main policy and research issues identified through the research, and the second contains the most relevant results of a comparative nature that were obtained in the project. These first two parts have been published by the International Development Research Centre in a single volume in English, Spanish, and French (109e, 109s, and 109f).

The third part of the Main Comparative Report consists of 12 modules containing material selected from the many reports produced during the STPI project. They provide the supporting material for the findings described and the assertions made in the first two parts of the Main Comparative Report.

The modules were prepared by several consultants, and given the diversity of topics covered, the IDRC staff did not consider it desirable nor possible to impose a single format or structure for their preparation. The reader will find a diversity of styles and structures in the modules and will find that the selection of texts reflects the views of the consultant who compiled the module. However, the modules were prepared in close collaboration with the Field Coordinator and were also submitted to a STPI editorial committee who ensured that they provided a representative sample of STPI material. They should be read in conjunction with the first two parts of the Main Comparative Report.

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## INTRODUCTION

The policy instruments described in this module comprise all those measures put into effect by governments that affect the structure and growth of industry and the behaviour of industrial firms, thus defining the pattern of demand for technology. These instruments constitute in fact an implicit policy in the field of scientific and technological development, and together with the instruments of explicit policies form the centre of attention of the STPI research effort. It must be underlined that the examination of these implicit policy instruments unquestionably demonstrates that technological decisions are in essence a dependent variable, affected and molded by the primary decisions of an industrial enterprise (i.e., selection of output mix and related decisions).

The instruments in this category affect the industrial fields in which technology is demanded, the sources to which this demand is addressed, the conditions under which this demand is satisfied, and in general the growth and development of indigenous scientific and technological capabilities. In general, these instruments do not act in a direct way to exert a demand pressure on the local research and development infrastructure. An important exception is the possibility of using directly the purchasing power of the state to create a demand for local scientific and technological inputs. But by and large, these policy instruments affect the pattern of demand for technology through their impact on a wide variety of decisions at the industrial enterprise level, which in turn have implications for the demand of technology.

As will be seen, these instruments can affect the type of technology incorporated into production by an industrial enterprise in terms of factor proportions, use of natural resources, and raw materials. They can affect a decision to import a given technology or to carry out technological research and development activities at the firm level. Furthermore, these instruments can be said to have a general impact on all technological decisions of firms (whether they are classified as major or minor) through their effects on the decisions on the output mix of industrial firms as well as their impact on industrial market structures.

It is interesting that in spite of the diversity in (a) the types of instruments analyzed in the different countries participating in the STPI project and (b) the heterogeneity of the industrial branches surveyed (limited to five branches with very different characteristics), there is a striking uniformity in the resultant implicit policies for scientific and technological development. As will be seen, lack of selectivity (i.e., a general across-the-board type of orientation) may account partly for this uniformity.

A very important group of instruments that have an implicit science and technology policy is not included in this module. These are the instruments of protectionism (tariffs and quantitative controls), which have been a major component in the strategy of industrial development of many countries participating in the STPI project. Because of their impact on the imports of embodied and disembodied technology they are examined in Module 6 on the instruments that affect the imports of technology. (Their impact on imports of disembodied technology is felt through the way they affect imports and import substitution of goods that require different disembodied technologies for their production.) The instruments included in this module are the following:

Industrial Programming and Mechanisms for Setting Priorities for Industry: These policy instruments consist of legislation, incentives, prohibitions, and other interventionist measures aimed at setting up and developing a country's industrial structure. These instruments are inserted into the framework of import substitution or export promotion industrialization strategies and are redesigned when the strategy changes as in the case of the recent emphasis given by several STPI countries to the development of basic and capital goods industries.

Industrial Financing Mechanisms: The main role of industrial financing instruments relates to their impact on the pattern of industrial growth and hence to the demand for technological inputs. They may be considered as the most powerful instruments



when the state controls their operations, in particular when dealing with large projects that go beyond the financial possibilities of a given enterprise or group of firms. Their role can also be decisive in reorienting demand for engineering services and industrial R&D toward local suppliers.

State Purchasing Power: Next to industrial programing and financing, the use of state purchasing power can be considered among the instruments with a key role to play in defining the patterns of demand for technology. In most of the countries studied, the state budgets represent a very large proportion of total consumption and of total investments, and in many STPI countries the state has become a direct producer, particularly in the basic industries sector.

Fiscal Measures: Measures related to the fiscal treatment given to enterprises (sometimes associated with subsidies, price control mechanisms, and credits) aim at modifying the environment that determines business decisions, with the expectation of achieving an effective change in business behaviour.

Price Controls: The effects of price controls on the demand for technological inputs cannot be clearly defined. They can increase profitability in a given industrial branch if it is a question of a guaranteed minimum price, or vice versa they can increase profitability if it is a question of a maximum price. The only case examined in the STPI project was the Colombian price control mechanism.

Export Promotion Measures: Most of the developing countries that have achieved a certain degree of import substitution industrialization have attempted to break their growth bottlenecks both by encouraging exports and by increasing import substitution. This may result in important reorientations in the demand for technological inputs.

## INDUSTRIAL PROGRAMING AND MECHANISMS FOR

### SETTING PRIORITIES FOR INDUSTRY

This section describes the legal and institutional devices used by the state to shape the industrial structure. These policy instruments consist of legislation, incentives, prohibitions, and other interventionist measures aimed at establishing and developing the country's industrial structure. These instruments are inserted into the framework of import substitution or export promotion industrialization strategies and are redesigned when the strategy changes, as in the case of the recent emphasis given by several STPI countries to the development of basic and capital goods industries.

In most STPI countries these programing instruments were found to be not very effective, for they were mostly indicative, had little selectivity, and their effect tended to be considerably weakened by other contextual factors, such as the country's general economic situation and upheavals in the international economy. However, indirect instruments for technological policies, the different forms of industrial programing and the means used for defining industrial priorities could be of great importance because, by influencing the structure of industry, they also condition its technological requirements.

This section discusses briefly the most important findings concerning instruments for industrial programing, and includes the following cases:

- |           |   |
|-----------|---|
| Mexico    | - Manufacturing programs.<br>The law for the promotion of new and necessary industries.<br>The decree concerning industrial decentralization and development. |
| Peru      | - The general law of industries.  |
| Korea     | - Instruments for export promotion.<br>The machinery industry promotion law.  |
| Argentina | - The law on the reconversion of the automobile industry.<br>- Regional industrial promotion instruments.   |
| India     | - The fifth five-year plan for the telecommunications and electronics industry.   |

These are, of course, not the only instruments used in each country, but they are the ones that were selected for study by the respective STPI teams.

The instruments for industrial programming examined can be classified in four broad categories, described below; the categories reflect a particular industrialization strategy that defines their consistency, although the set of instruments for a given country seldom falls completely in one category or another.

(a) The first category consists of a broad system of incentives with few or no obligations on the part of the enterprises that are supposed to benefit from them. These are intended to modify the economic environment for the enterprise so as to orient its behaviour in a desired direction, particularly in terms of investments. These incentives modify the structure of rewards for intervening in a particular field or area of industrial activity. The approach followed by Korea fits roughly into this pattern.

(b) A second category consists of a system of incentives closely linked to a set of state controls, but limited to an agreement whereby if the private firm complies with certain requirements affecting its business conduct (which refer mostly to the orientation of new investments or reinvestments), the state grants the enterprise a set of benefits and incentives. The approach followed by Mexico conforms to this pattern.

(c) Another category covers a system of compulsory constraints which limit the scope of action for the enterprise. In this case the entrepreneurs, even at the expense of their profits, have to modify their behaviour to satisfy a given industrial policy defined by the state. Through this mechanism the state attempts to reshape the industrial structure without getting directly involved in productive activities. The Argentinian case fits roughly into this pattern.

(d) Finally, the state can also intervene actively and directly in shaping the industrial structure through the establishment of public enterprises, or through joint ventures with private enterprises where the financial or equity position of the state is generally decisive. This kind of instrument has usually been resorted to in the basic industry sector where investments and risks are high and profit expectations low, but it can also extend to many other areas of industrial activity, as in Peru.

In view of the above typology, the instruments for industrial programming examined tend to fall mostly into the first two categories and to have a rather weak influence on the process of determining the industrial structure. Furthermore, when the instruments acquire greater compulsory power, problems emerge related to the difficulties for the state to regulate industrial growth strictly and to run vast industrial programs. Most STPI countries, therefore, have let market forces shape their industrial structures, with the state assuming a passive role. This has led to the concentration of capital in the hands of large enterprises (where foreign capital predominates) and to regressive patterns of income distribution.

A further issue that confounds the impact of state intervention in shaping industry is the fact that industrial programming mechanisms usually have been based on rather general economic considerations responding to immediate balance of payments, shortage of inputs, or similar problems, rather than to rationally conceived industrialization plans. This implied the indiscriminate support of all types of industries, which for the most part focused primarily on the internal market, although Korea is an exception in the sense that indiscriminate support was given mainly to export-oriented industries. With few and recent exceptions, this also meant that little attention was paid to the demands for technical inputs that industry would require.

Nevertheless, industrial programming and the mechanisms for defining priorities could become key instruments because they are supposed to define the structure of industry, which in turn shapes the pattern of demand for technology. This can be seen, for example, in the fact that a specialized, well-articulated (in terms of backward and forward linkages) industrial system can provide a solid basis for continuity in technology purchases, both at home and abroad, for the absorption of technology and for the negotiation of technology imports. This would improve the possibility of developing an indigenous capacity in selected industries, manufacturing enterprises, engineering firms, and research laboratories. Also, the promotion of capital goods industries, which develop and change in constant interaction with the industries that use these capital goods, could also have important positive effects on technological development, provided a certain degree of specialization is allowed. Several STPI countries have realized this (particularly Brazil, Korea, and Mexico) and have taken measures to

ensure the rapid and steady growth of their capital goods industries.

## MEXICO

### Manufacturing Programs

In 1965 manufacturing programs, designed as an instrument to increase the degree of national integration of industry and to deepen the process of substitution industrialization, were established. The immediate background of this instrument is characterized by the efforts to "Mexicanize" and to integrate the automotive industry. These efforts were placed under the control of the Ministry of Industry and Commerce (SIC). The aim was to induce producers and importers to substitute foreign purchases, vertically integrating their production processes (if they commit themselves to produce the inputs that are usually acquired abroad), or finishing imported articles.

The interested enterprises submit their manufacturing program to the Ministry of Industry and Commerce, and the conditions of quantity, quality, price, and length of time involved are taken into account before approving the programs. The manufacturing program agreements are usually divided into 6-month stages, specifying for each one the substitution of imports that should be attained, or the progress that should be made regarding the utilization of raw materials, inputs, and parts of components of national origin. The benefits received by the enterprises whose manufacturing programs have been approved are the following:

(a) The product manufactured by the enterprise is submitted for approval under the licence requirement regulation, and the enterprise receives import licences for that product (or for those that are necessary for its activities).

(b) The enterprise may receive tax incentives under the Decree Concerning Decentralization (and previously under the New and Necessary Industries Law and Regulation 14). (The incentives offered by these instruments are considerable, as is seen in the following section.)

(c) Furthermore, the enterprises are given authorization to sell their products at prices higher than those set in the international market (with the differential approved by the Ministry of Industry).

The submission for approval of a product manufactured by an enterprise (and previously imported) under the licence requirement regulation guarantees that enterprise an exclusive market (often even before beginning to produce).

The discretionary power behind this instrument is enormous and its potential is promising because it allows for a great degree of selectivity. Nevertheless, the criteria that govern its use have not been explicitly described or made known: priority industrial branches have not been defined, nor the types of projects that should be given preference, nor which types of enterprise make up each branch, etc.

The requirements that must be met to receive approval of a manufacturing program are the following: the authorized price differential must not exceed 25% of the FOB price of imported products (however, in some industries greater differentials may be authorized); the degree of national integration must reach 60% of the direct cost of manufacture; 51% of the enterprise's social capital must be held by Mexican citizens; the products must be of the same quality as the imported products; and, before the creation of the National Registry of the Transfer of Technology (RNTT), it was required that the payments for technology must not pass the limit of 3% of annual net sales (at present, proof of registration is the only requirement). Furthermore, an attempt to promote exports has been made by making fulfillment of export programs a condition for receiving approval.

According to a study done by CEPAL-NAFINSA, the principal branches that benefited from 1965 to 1970 were the automotive industry, internal combustion engines, parts and replacements for automotive vehicles, tractors, bicycles and motorcycles, construction equipment, tools, pumps and compressors, pipes, radio and communications equipment, agricultural implements, chains for industrial uses, the chemical and petrochemical industry, electrical equipment and accessories, and office equipment (1). According to the same study, "in most of the cases joint investments involving foreign and Mexican capital are involved."

The initiative to present manufacturing programs rests with the entrepreneurs, and the Ministry of Industry and Commerce limits itself to studying the applications and

dictating its decisions about them. With regard to capital goods, the manufacturing programs do not function like Nacional Financiera's project ONUDI (concerning capital goods), in which the aim is to identify, negotiate, and launch specific industrial projects. By waiting for the initiative of entrepreneurs, the instrument loses selectivity and may be utilized to promote projects that are of little interest or relevance.

Furthermore, criteria concerning the selection of technology, the links with the scientific and technological system, the performance of technical or R&D activities, etc., are not applied in the management of this instrument. Its link with the Decree Concerning Industrial Decentralization and Development is positive, but the application criteria mentioned in that instrument have not been precisely defined.

The lack of such application criteria is also reflected in the fact that the levels of national integration, the plant value added, and the composition of social capital required are invariable, even though enterprises from different branches of industry are dealt with. Thus, 60% of industrial integration is required of an enterprise in the metal mechanics or petrochemical industries, in which the level of industrial integration may be low. The plant value added (a minimum of 10% of the direct cost of manufacture) also may be very low in some industries. Finally, the requirement that 51% of the capital must be of national origin is a formal requirement, which does not accurately reflect the position of the decision-making power of an enterprise: it is important to examine this element in relation to the origin of the technology, the negotiating capacity of the nationally owned part, etc. These criteria have not been defined, and therefore the instrument is open to abuse.

The manufacturing programs have been recognized as an instrument of great potential because of its flexibility. Nevertheless, as long as it continues to respond to objectives of such limited scope, its utility will also be limited. If, however, it is difficult under the protectionist system to perform modifications to pursue an objective of autonomous technological development without introducing other types of distortions, the situation is radically different with manufacturing programs. The possibilities of examining each draft program individually allow diverse criteria to be incorporated. These possibilities are presently annulled because the instrument is linked to the protectionist system, and its pursued end is limited to the promotion of the substitution of imports.

Moreover, the instrument is voluntary (since it is not obligatory to have a manufacturing program approved to fulfill any legal requirement), and the initiative lies with the entrepreneurs, who are allowed to apply for incentives, whether within the scope of this mechanism or outside it. The negotiating position of the responsible authority in relation to the entrepreneurs is limited by this fact. Thus, the selective application is even more limited. If it is added that there are no sectoral priorities of any kind and that the application criteria have not been explicitly defined, it is logical to conclude that this instrument has not been used to its best advantage from many points of view. The lack of criteria concerning which types of enterprises may have their manufacturing programs approved is especially serious: the CEPAL-NAFINSA study of 1971 revealed that the majority of cases were "joint investments of Mexican and foreign capital" (2). The rationale of an instrument that grants such powerful incentives (for example, the guarantee of a reserved market) to transnational enterprises is questionable.

If this instrument was inscribed within the framework of a well-defined industrial policy, its contribution could be extremely valuable. However, it would be necessary to define clearly the sectors to which this policy would give priority and the types of enterprises that would be eligible to present programs. The instrument should cease to be considered as a means for granting protection to industry; it should be considered as a mechanism that permits correct industrial programing and the promotion of industrial projects, coordinating the granting of the different incentives that the state offers. This is the only instrument of industrial policy in which the state examines the production plans of private enterprises (notwithstanding its being voluntary) and facilitates its intervention in the technological aspects. The manufacturing programs could become an important instrument of technology policy.

For the promotion of autonomous technological development, it would be necessary to incorporate into this instrument various criteria concerning the principal technological decisions of the enterprises. With new industrial projects, it is possible to examine the process of search and selection of technology. Interest should be shown

not only in the aspect of negotiation and the formal conditions for the acquisition of technology, but in an entire set of key questions. These include (a) the adaptability of the technology on the national market scale, and (b) the possibilities of separating the technological package and performing some of the research and experimental development or basic process design activities locally, and manufacturing the equipment and machinery in the country.

#### The Law for the Promotion of New and Necessary Industries (LINN)

The Law for the Promotion of New and Necessary Industries (LINN) classifies as new industries those devoted to the manufacture of goods not previously produced in the country as long as they are not simple substitutes, and as necessary industries those devoted to the manufacture of merchandise produced in insufficient quantities in the country. The exemptions granted by the Law could refer to import taxes, export taxes, indirect taxes, or income taxes. The amount and duration of the exemptions were determined in relation to the importance of the industries (classified as basic, semibasic, and secondary) (3), and in relation to a series of requirements and conditions that were very difficult to verify or apply on the part of the fiscal authorities.

Some of these requirements were the following: the degree of elaboration in the plant must be a minimum of 10% (the degree of elaboration was defined as the participation of the sum of salaries and the cost of electrical energy and fuel used as a percentage of the direct total cost); the imported inputs could not exceed 40% of the direct cost of manufacture (i.e., a 60% degree integration); and since 1968-1969 it has been required that the payments of royalties and technical assistance should not exceed 3% of net sales. Nevertheless, the restrictive clauses of the technology contracts were not regulated.

Among the additional conditions that were included to determine the amount of exemptions, the following are the most relevant: the quantity and quality of the manpower employed, the degree of technical efficiency, the utilization of equipment and machines produced in the country, the percentage of the national market that would be satisfied, the amount of the investments, the social benefits above the legal minimums, and the importance of the research laboratories owned by the enterprise.

To increase the confusion, extensions for up to 5 years could be obtained by the basic and semibasic industries, as long as the industry under consideration provided evident benefits to various sectors of national production or to the consumers, and if the industry was falling short of recuperating from its profits 20% or more of the initial investment.

It is evident that most of these criteria have been dead-letter rules because of the great difficulty in applying them. The Regulation that specified the application of the Law made a mediocre attempt to define their content, but the result was simply to increase the difficulty in implementing the Law.

The criteria that could have had an impact on the technological behaviour of the enterprises were never applied:

(a) It was never even attempted to define what should be understood by "degree of technical efficiency" in terms of price differentials in comparison with similar foreign products, or by installed capacity effectively utilized.

(b) Regarding the degree of utilization of capital goods, inputs, or raw materials of national origin, the excessive formalism of the Mexican industrial policy has always ignored the difficulties in measuring "national integration" in terms of goods that incorporate components with variable degrees of integration.

(c) As may be expected, an attempt was never made to define the criterion concerning "quantity and quality of manpower employed," because it is practically impossible to define a parameter to make comparisons without first defining a strategy concerning the utilization of more or less labour-intensive techniques in each sector of economic activity.

(d) Finally, the criterion concerning the research laboratories ended up being inoperative without a definition of what was meant by research.

In any case, the precise definition of all these criteria should have been complemented by a degree of institutional support adequate for their application. It seems that this set of complementary dispositions simply served as dressing for the

principal text of the Law.

The Law should be classified as part of the substitution industrialization policy, emphasizing the manufacture of new articles (even though their relevance to the process of development may be nil), and attempting to promote the rapid accumulation of capital. In many cases, LINN may have aided in creating a not very favourable climate for technical change and increased efficiency, because it discriminated against product substitution (even when efficiency would have been increased). LINN sought to correct this by establishing an exception that is almost impossible to fulfill: i.e., when the advantages of product substitution represent a 20% savings for the consumer. Furthermore, the period of duration of the exemptions turned out to be too long (the average in the enterprises that benefited was 10 years). In many cases, an enterprise classified as new could manage to be reclassified as necessary and thus to lengthen even more the life of the exemption (moreover, the possibility of obtaining extensions existed).

Finally, the lack of the Law's selectivity and the difficulty in implementing its criteria annulled its impact on the orientation of industrial investment. The enterprises that benefited were invariably the largest (the capital invested in the exempted plants under this incentive clearly exceeded the average indicated in the industrial census) and relatively the most modern, and were located for the most part in the Federal District and its metropolitan area. However it is precisely the largest enterprises that have the least need for "protection" (because of their larger scales of production and their greater possibilities to have access to sources of credit and to obtain better conditions in the purchase of machinery and equipment).

During the last few years the exemptions granted under LINN began to be limited, due, in part, to some of the reasons mentioned, but also due to the necessities of financing public expenditure, and, finally, due to the fact that from 1971 to 1972 a new mechanism was created to replace this instrument.

#### The Decree Concerning Industrial Decentralization and Development (DDDI)

The Decree Concerning Industrial Decentralization and Development (DDDI) has some of the characteristics of LINN, but it also incorporates additional elements - it seeks to respond to the objectives of a policy of regional development, and it reorganizes the group of industrial promotion instruments through fiscal incentives (facilitating the precise calculation of the incentives that may be obtained by a new industrial project). Actually, the Decree represents an attempt to rationalize the geographic distribution of the industrial activities and to reduce the intense concentration that has formed around the principal cities of the country: in 1965 the metropolitan area of Mexico City absorbed 16% of the population of the country, 45% of the added value of industry, and 62% of the country's investment in higher education. It is evident that the external economies in the broad sense of the word (public services, infrastructure, access to markets, proximity to decision-making centres, endowment of skilled manpower, etc.) constitute a determining factor in decisions concerning the location of an industrial plant.

Seeking to counterbalance such a powerful attraction, this instrument grants a series of incentives to the enterprises that establish themselves in the less-industrialized areas of the country.

The amount and duration of the exemptions were fixed discretionally, taking into consideration the location of the plant and the following requirements: 51% of the social capital must be in Mexican hands; payments for royalties, technical assistance, or trademarks must be less than 3% of net annual sales; the technology contracts must not contain restrictions against exportation that are against the national interest; the credits contracted abroad must be approved; there must be 60% national integration; Mexicans must be in charge of the administration of the enterprise; and, in enterprises that are to satisfy shortages in national consumption, the price differentials must not be greater than authorized (usually 25%). Presently the regulation of the technology contracts is left under the control of the National Registry of the Transfer of Technology (the only requirement proof of registration).

In the definition of enterprises that may receive tax exemptions, DDDI seeks to correct the deficiencies of LINN; however the bias still remains in favour of those enterprises that perform new activities (although they may be new in one region but not necessarily throughout the entire country). Furthermore, the following enterprises are

included: those that exploit natural or agricultural resources in each region, those that rationalize their production in favour of the consumer or that satisfy shortages in national consumption, and those whose promotion has particular interest for the country (taking into account the generation of employment, greater integration of the industrial plant, the volume of investments in technological research, exports, or their contribution to development). The Decree points out that the rationalization of production should be reflected in a reduction of 5% in the sales price (in contrast with 20% in LINN) during a period of 2 years: these are again conditions that are relatively difficult to fulfill for enterprises that produce substitution goods.

The exemptions that are offered under the Decree are the following: 50% to 100% of the general import tax; 50% to 100% of the stamp tax; 60% to 100% of the income tax on profits derived from the sale of real estate that is part of the fixed assets of the enterprises; 15% to 40% of the income tax that corresponds to the aggregate income of the enterprises that locate themselves in Zone III; authorization to depreciate at an accelerated rate investments in machinery and equipment for fiscal purposes; up to 100% of the indirect tax (4).

As in other instruments of Mexican industrial policy, the application criteria related to technological decisions suffer from defects that make their implementation difficult. The volume of "investments in technological research" is an empty concept that could be misleading. Without a definition of what constitutes technological research, and without an institutional infrastructure capable of distinguishing between the testing of materials or the solution of specific technical problems and the construction of a pilot plant to develop a process or the design of a prototype, this part of the Decree is a dead letter. Furthermore, the inclusion of this criterion turns out to discriminate against the enterprises that, although they do not carry out technological research, have established internal units to perform technical activities that permit the attainment of knowledge that is indispensable for the acquisition of greater technological capacity.

However, even overcoming these faults, two unanswerable questions remain. The first is related to the orientation of R&D in the enterprises: Is it desirable to increase the amount and duration of the exemptions, even though the research is designed to develop capital-intensive technology, which contaminates the environment, which intensively utilizes either natural resources or services such as energy and water that are not renewable, or which is related to products or services of little social significance (oriented toward artificial product differentiation, for example)? It is evident that if this question is not answered, the introduction of a criterion concerning technological research could result in an increase in fiscal loss in favour of activities with high social costs.

The second question is related to the distribution of the fruits of the research: Is it desirable to promote (through fiscal loss) the performance of research that does not benefit the Mexican economy? The question is especially applicable to transnational enterprises that are operating in Mexico and that are able to carry out R&D activities whose results will be utilized by the enterprise as a whole: the subsidiary in Mexico may or may not benefit from the results of research that international strategy has defined. This is an important point, especially when one considers that there is no limit to the amount of profits that may be remitted by these subsidiaries to the main office (5).

Although the DDDI instrument and others introduce new elements in the policy of the promotion of industry, the essential features of LINN that remain are the following:

(a) There is a lack of selectivity in the promotion of the industrial branches and sectors that are considered important for the entire development effort. No criterion has been established that could permit a distinction between different branches of production for the purpose of orienting decisions about which goods to produce. Thus, tax exemptions are still granted for the promotion of the cosmetic industry or the industry of "porcelain figures." This fact has serious implications for technological decisions made at the enterprise level because the selection of the combination of goods to be offered frequently determines the origin and characteristics of the technology to be utilized.

(b) In general, these instruments are subordinate to the same objectives of import substitution and rapid capital formation. Therefore, the effects of these decrees

on the technological decisions of the enterprises should be examined in light of the battery of instruments of industrial policy: protectionism, fiscal exemption for re-invested profits, high coefficients of depreciation of fixed assets, etc. The final result is a bias in favour of capital-intensive techniques and an inducement to the maintenance of inefficiencies in production (extremely high cost structures, considerable levels of nonutilized capacity, etc.).

(c) The application criteria are difficult to handle; however, as long as an operative definition of each one has not been defined, they will remain dead letters. So far, the authorities responsible for the application of this instrument have not defined the content of criteria such as the "volume of investment in technological research," or the "number of jobs generated," nor can they count on institutional support adequate for their application. The same problem arose with the criteria included in the New and Necessary Industries Law and its Regulation.

(d) The lack of coordination with other instruments of the industrial policy persists. This is true not only with instruments such as public banking credits and fiscal incentives for exportation, but also with instruments related to the conservation of the environment. It seems that a general rule is followed of compartmentalizing the objectives of the instruments and of establishing a great dispersion of official attributions in several public agencies.

The Decree utilizes only one criterion for determining the different zones of the country: the degree of geographic concentration of the industry. Therefore Zone I is made up of 95% of the total area and includes regions of relatively unequal development; Zone II comprises general townships in the states of Jalisco, Mexico, Morelos, Puebla, and Queretaro; and Zone III includes the rest of the country. The different resource endowments of each region are not taken into account, nor their possible uses. The fundamental cause is that the definition of a strategy of regional development necessarily implies the definition of a development model, and the Mexican government has already pointed out that it is not willing to establish orientations for industrial development. (Furthermore, when the Decree was issued, the information about the distribution of natural resources within the national territory was not available.)

It is not surprising, therefore, that DDDI does not include criteria concerning the utilization and conservation of the environment. In general, the regionalization it establishes is extremely deficient, and the urban-rural relationship will remain unaltered in any important sense by the Decree.

The Decree seeks to promote industrial decentralization by granting incentives to those enterprises that locate in noncongested zones. However, even this limited objective is difficult to fulfill for several reasons. Important external economies found in the more industrialized zones (services, communications, and especially the endowment of skilled manpower) probably outweigh whatever effects any incentive to decentralize may have. The amount of programmed private investment per man employed is less in these zones, as may be seen from the analysis of the applications for exemptions that were granted (Table 1). Moreover, the cost of the majority of the public services is the same no matter where the plant is located. The Federal Electricity Commission recently established a system of differential rates based upon location, but the provision of petroleum and its derivatives is carried out under a common rate (or with minor modification). It has already been pointed out that the subsidy received by an enterprise by way of low prices in these and other inputs (for example, water) makes the selection of less capital-intensive techniques (and those that conserve these services) unnecessary. It is also important to point out that the price of public services is not a major variable in private calculations concerning plant location.

Furthermore, in the secondary petrochemical industry there exists an implicit incentive for concentration in more developed zones. The state enterprises in the basic petrochemical industry and PEMEX provide the raw material to plants near a basic petrochemical complex in Zone III, as well as to a plant located in the industrial zone of the Federal District, with no difference in price. The advantage of locating the plant close to the final market, given the characteristics of the process, is evident: in general, the product will increase in weight and thus in cost of transportation during the last stages of the process. But applying the same reasoning to other branches of industry, it is possible to conclude that the Decree will affect different enterprises in different ways, according to the characteristics of each process.



The analysis of these incentives reveals serious deficiencies and it is advisable to doubt their effectiveness. From the point of view of technological development, this instrument will not have a relevant impact on decisions to invest resources in R&D activities. However, it may constitute an unnecessary incentive for the selection of capital-intensive technologies (6). Nevertheless, in some respects the recommendation of application criteria for the Decree may be unimportant unless a strategy for regional development is defined that includes the industrial branches whose promotion is desired and that defines the priorities of the exploitation of natural resources and the conservation and utilization of the environment. Once that strategy has been determined, these incentives should promote not only R&D but also the performance of technical activities. Furthermore, the tax exemptions should be restricted to Mexican industries (for example, requiring a minimum participation of 90% national capital) and not serve "infant" industries such as General Foods or Imperial Chemical. Foreign participation may be increased if state participation is important in some industrial project.

Of course, coordination with other instruments of the industrial and technology policy is indispensable. The Decree, in particular, should act in coordination with the other regional incentives, as well as with the federal states, to avoid the accumulation of fiscal incentives in a few enterprises. The intervention of organisms such as CONACYT and the Undersecretary of the Environment is necessary. Nevertheless, the definition of criteria and the design of new policies and instruments are necessary within these organisms as well.

## PERU

### The General Law of Industries

The General Law of Industries, aimed basically at establishing priorities for industrial development, was promulgated in July 1970 (Decree Law 18,350). It is aimed at promoting and programming industrial development, favouring basic industries and those producing capital goods. In this regard, the Law contains within it a specific strategy of industrial development that gives priority to the promotion of basic industries and the production of capital goods.

The assignment of priorities to industry consists of the following elements: definition of industrial priorities; the allocation of industries by property sectors according to priorities; and the establishment of incentives according to priorities.

Industrial Priorities: The General Law of Industries considers the following priorities for the sector:

(1) First Priority consists of the following: basic industries (iron and steel, nonferrous metallurgy, basic chemicals, fertilizers, cement, paper); specific industries producing capital goods and other fundamental inputs for production (machine tools and automobile parts); electric and steam-generating machinery (heat exchangers, pumps and compressors, parts and pieces for the latter); specific basic machinery for mining, energy, fishing, agriculture, transportation, communications, construction, and basic industry; electronic components and special conductors; aeronautical material; ship-building; fundamental subassembly elements for land transportation; production of basic inputs; organic and inorganic chemical products that are basic inputs for the chemical and other industries; and enterprises that produce industrial technology, i.e., those that conduct research and industrial development programs.

(2) Second Priority is made up of the support industries producing goods that are essential to the population and inputs for production: social support industries producing essential mass-consumption goods to satisfy the individual and collective primary needs of the population with regard to food, clothing, housing, health, education, culture, recreation, and transportation; and support industries producing goods and inputs for productive activities such as agriculture, livestock raising, fishing, mining, energy, construction, industry, transportation, and communications.

(3) Third Priority is made up of complementary industries producing goods that are not essential to the population and supplementary inputs for production.

(4) Nonpriority consists of industries producing luxury and superfluous goods.

Allocation of Industries by Types of Property Sectors: The Law considers three types of property or ownership of industrial enterprises:

(1) Public Sector: this consists of enterprises belonging to the state and operated under domestic public law.

(2) Social Sector: this consists of industrial enterprises operating under special laws, under the supervision of the state.

(3) Private Sector: this consists of enterprises belonging to individuals and/or juridical persons governed by the Commercial Corporation Law and the Commercial Code.

Bearing in mind this property structure, the Law establishes that basic industries are reserved for the public sector, although the state can develop them in partnership when it deems it necessary. The private and social sectors will participate in those industries not reserved for the public sector and can only, on exceptional occasions, participate in the basic industries in association with the state or independently when the industrial development plans so require.

Incentives According to Priorities: The Law establishes for the industries, according to their priorities, a group of tax, credit, and other incentives.

The period in which the General Law of Industries has been applied is still too short to be able to arrive at final conclusions from the existing information. Yet it is possible to make some comments. The effects of the application of this instrument on the Peruvian industrial structure are very limited. Tables 2 and 3 show the results of the application of the General Law of Industries.

From these tables it can be concluded that the application of the General Law of Industries has not favoured the participation of the priority industries in the industrial production structure; on the contrary, it has not prevented (if not caused) a decline in their participation, an increase in the participation of the third priority industries, and a maintenance of the participation of the nonpriority industries.

The Peruvian STPI team did not attempt to give a full explanation of this fact but it provided elements that can partially explain the situation:

(a) First, the short period of application of the Law cannot be expected to lead to substantial changes in the productive structure of the industrial sector; furthermore, absolute validity cannot be attributed to the results inasmuch as they do not show clearly differentiated trends.

(b) Other factors that have apparently played a part in the results noted are the pricing policies and the property system. As is known, the pricing policy establishes price controls on a series of products, which are basically included in the first and second priority lists, the third and fourth priority items not being subject to any type of price control. It is also known that the state participates mainly in the ownership of first priority enterprises.

In view of these remarks and the results shown in Table 2, it can be deduced that the growth in the participation of the nonpriority industries (especially third priority) can be partially explained by the fact that, being almost totally private industries whose production is not subject to price control, they probably found an incentive for increasing production or investing in products for which private entrepreneurs expect greater profits, rather than seeking the incentives granted to the priority industries.

In the case of first priority production, the impact of the pricing policy is not as clear because although these products are considered within the package of products submitted to price control, an important percentage of these first priority industries is the property of the state. For that reason the impact of price controls is felt less than if they had been private enterprises, because the latter do not require direct incentives and their investment decisions depend, rather, on political criteria.

Another explanation for the stagnation of the participation of first priority industries appears to be that the maturation period of investments in basic industries is so long that the fruits of these investments cannot be appreciated in a period as short as that under consideration. In the basic industry enterprises that still belong to the private sector, the fact that they do not reinvest appears to be a result of the fact that they expected that at some moment their properties would have to revert to the

state in accordance with the Law.

Finally, the stagnation of the participation of second priority production (essential consumer goods), as in the previous case, does not appear to have much to do with the price factor. It can be explained, rather, by factors such as restrictions on demand deriving from the economic crisis and from limitations on the availability of inputs that result from the problems of the agricultural sector and the limitations on the availability of foreign exchange.

## KOREA

### Instruments for Export Promotion and Their Relation to Industrial Priorities

Several types of programs have supported the industrial development of Korea. Chief among them are the following: incentives and special assistance to industry to facilitate investment, operations, and, specifically, exports; financial assistance to industry operating through the banking system and through special government funds or arrangements; and the program for the development of R&D capabilities to assist in technical problems relating to product design, production practices, and similar matters.

To offset the progressive inflation of its currency, Korea initiated industrialization based on the policy of import substitution with high tariffs and quantitative restrictions providing protection to industry. Korea completed the import substitution of nondurable consumer goods by 1960. A growth strategy based on the further import substitution of machinery, durable consumer goods, and their intermediate products did not seem to be a viable alternative because of the smallness of the domestic market and the large capital requirements that this policy entails. Korea then opted for an export-oriented policy to exploit market opportunities to provide both a high growth rate and increased employment.

This export-oriented policy of Korea makes it impossible to attempt a separate examination of the policy instruments related to industrial priorities, on the one hand, and the instruments related to export promotion and even quality control and standardization on the other. The set of instruments for all these purposes is very coherent in Korea and their grouping is therefore rather arbitrary. The most relevant issues are discussed in this section.

The most important contextual factors to take into consideration for the Korean policies of industrialization were the 100% devaluation of the won in May 1964 and the doubling of interest and bank rates on loans in September 1965. Along with these were the price-stabilization and tax-reform program established by the government to control inflation, and the rise of the ratio of tax revenue to GNP. Furthermore, since 1964 the government has tried, through successive devaluations, to maintain the won at the free-trade level and provide various export incentives both to encourage exports further and to offset the modest degree of progressive overvaluation that developed after each major devaluation. The system was further liberalized in 1967 when a shift was made from the so-called list system, under which only those commodities listed in the trade program could be imported, to the negative system, under which all commodities not listed were automatically approved. Tariff reform was also undertaken in the latter part of 1967 and again in early 1973 to reduce generally the average tariff rates on imports.

The major thrust of the industrial policies was directed toward the export-promotion program. Foremost among the export incentives were customs duties and commodity tax exemptions on imported raw materials that are used in the manufacture of export goods, a 50% reduction in income tax on export revenues, and a 100% reduction in business tax (the highest marginal tax rate on private corporations is 49% and on open corporations, 27.5%, so that the exemption could amount to about 25% and 14% respectively of net income). Preferential interest rates on loans were also introduced. Exporters could borrow up to 90% of their requirements at 6%, whereas the commercial rate was 25%. The same rate applied to loans for the import of raw materials used in exports. A wastage-allowance system was also included. The amount of material that could be imported duty-free included a liberal allowance for wastage or scrap involved in converting the material to its final use. In case these were not used for export production, they could be sold or used for domestic production at a substantial profit.

The government established annual export targets, and exports were apportioned on a firm-by-firm basis through negotiations between the government and the industries' export associations. These targets were generally met or exceeded, as credit allocations, tax assessments, and import licences were preconditioned on satisfactory export performances.

This rather complex system of incentives and subsidies has, however, vastly increased the proportion of exports in total manufacturing in Korea. Commodity exports increased from \$55 million in 1962 to \$3.2 billion in 1973 and \$4.5 billion in 1974, and now constitute about 30% of the value added in manufacturing. As suggested by the recent studies, the rate of subsidy on total exports was about 7% to 9% in 1968, although for manufacturing exports it was in the range of 9% to 11%. The average rates of protection were also around 15%, which is quite low by international standards. No appropriate measurement of effective protection rates exists, however a measurement that would have to take into consideration in some way the prevailing low wage rates of Korea.

The duty tax exemption was intended to supply exporters with raw materials at international prices, and the wastage allowance helped the industry during the initial learning process.

The case for tax concessions and preferential interest rates is somewhat different and more complex. In Korea, interest rates on commercial loans were higher than 22% from 1968 to 1972, whereas loans from private unorganized money markets have been priced at an annual rate of 30% to 40% or more in real terms. The tax concessions, therefore, were intended simultaneously to compensate exporters for the high interest rates paid on nonpreferential local loans as well as to improve profitability, financial structures, and growth capabilities of the export industries. Similarly, the purpose of preferential interest rates on loans was to permit exporters to compete in terms of credit and payment arrangements that are commonly required in international trade.

In summary, the instruments examined seem, on the whole, to have had the effects intended of stimulating the export industries. Nevertheless, the system did not lead to necessary changes in the industrial structure and to the establishment of linkages that now seem crucial. As a result, some industries are now faced with the need to undergo changes, particularly in stimulating the growth of supplier industries to the end-producing industries.

The rapid economic growth has led to a number of industrial weaknesses. First, the pursuit of market opportunities has led to specialization not only in industry, but also by stages of production within industry (primarily assembly operations). This strategy served Korea remarkably well during a time of continuous growth, but also made Korean industry particularly vulnerable in times of recession, and made it structurally imbalanced too. Second, the administration of export incentives for a large and sophisticated economy has proved extremely complex. Finally, industrial growth has not been accompanied by an equivalent capability in product design and adaptation to market needs.

The presidential decree of August 3, 1972, was aimed at confronting this situation by improving the financial structure of industry and of money and capital markets. The export incentive system was also revised in 1973. Its remaining features are the import-duty drawback, export-financing facilities, and a limited investment incentive. To maintain the competitiveness of Korea's exports, the Korean currency was devalued. The 1972 measures could therefore mark a basic philosophical departure from previous policies, which relied on generous incentives to compensate for structural weaknesses in the pricing system. In the past they may even have contributed to the growth of these factors. By contrast, the new policies aim at correcting these deficiencies directly by improving the industries' financial structure and the functioning of capital markets, by providing investment incentives for backward integration, by developing R&D capabilities, and by adopting more severe foreign exchange rates. Nevertheless, many programs are still in the formative stage.

This strategy has left Korean industry vulnerable to fluctuations in world trade, as illustrated by the underutilized capital in the plywood industry as a result of the recession in the housing industry in the United States. Particularly vulnerable are those industries that have concentrated on only one intermediate stage of production on a subcontracting basis, such as offshore assembly operations (e.g., electronics). These industries have not had the time to integrate backward in technology and forward in marketing and are therefore particularly susceptible in times of difficulty to being

squeezed by their contractor, who controls technology and marketing outlets. The large layoff of workers in electronics assembly operations is a particular case in point.

#### Machinery Industry Promotion Law

After its successful drive toward export-oriented industrialization, the Korean government designed policies to increase the domestic content of industrial production. This policy was mainly concerned with the machinery industry. It was generally recognized that development of the machinery industry was lagging behind other industrial sectors.

The basic legal device of these policies was the Machinery Industry Promotion Law. The Ministry of Commerce and Industry (MCI) is responsible for its implementation.

Although the basic goal of the policy appears to be sound, such a policy would be extremely difficult to implement because of its complexity. The important issue therefore is the degree of rationality in its implementation and whether such a policy can be effectively implemented at all by the government. Some of these problems have been recognized recently by the government and this policy is presently undergoing review.

The Machinery Industry Promotion Law (promulgated in 1967, revised in 1971) requires the Ministry to formulate and announce a master plan for domestic production of all the major imported machine products and parts. The Ministry establishes a general target percentage of domestic content for machine products, and machine producers submit plans for domestic production with specified target dates for each part. The plans are then examined and approved by the Ministry and revisions are made twice a year. In passenger automobiles, for example, the percentage of domestic content is regularly examined by the Ministry, and 1977 was set a target date for complete domestic production.

Based on such a master list of machinery products, the import restrictions on machinery parts are established and announced twice a year. The items produced domestically in sufficient quantities are banned from import. Permission for the import of other items is given after certification that domestic supply is inadequate and plans for domestic production have been drawn up by the importer.

This Law also enables the Ministry to use tariff and tax measures for the promotion of domestic production. High tariffs are imposed on products that can be produced domestically. Tax benefits are provided when an enterprise succeeds in the domestic production of imported items.

For positive promotion of the domestic machinery industry, the Ministry can designate strategic industries that are important for increasing the domestic content and can provide direct financing with favourable terms for the enterprise.

The major responsibility for implementing the policy to increase the domestic content of industrial products is given to the Ministry of Commerce and Industry, and within MCI the Machinery Industry Bureau has the major task of preparing plans for domestic production and import or tariff restrictions. The bureau chief has the responsibility for approving the importation of restricted items on the basis of domestic production capability.

The Council for the Machinery Industry was established under the Law to advise MCI on matters related to the machinery industry. It consists of high-ranking officials from other related ministries, government research centres, and banks, and other specialists appointed by the Minister of Commerce and Industry. Among its many tasks, the Council can provide advice on plans for the domestic production of imported machinery products.

The Korea Society for the Advancement of the Machinery Industry, on the other hand, is a private organization established in 1968 with government approval. Major machine manufacturers are represented. It provides consultation to the government about policy directions for the development of the machinery industry and offers information on technology, markets, and investment to the manufacturers. It has the responsibility for screening the importation of items that have been approved by the government in general categories.

This instrument for the promotion of the machinery industry affects all the major machinery industries from automobiles and capital goods to electrical appliances. All the major companies had to prepare and submit detailed plans for the domestic production of

all the imported parts. Therefore, the coverage is fairly complete.

Yet such a policy requires formidable technical and administrative tasks on the part of government officials and cannot be implemented effectively and rationally. The number of items involved is enormous and the production of each item can be so complex that no government organizations, even with the assistance of outside specialists, can perform the task.

The first problem in such an instrument is that it is almost impossible to define the domestic content of a product. Presently, a domestic product is defined by whether the final stage of its production was performed within the country or not. This criterion is certainly inadequate; consequently a more rational criterion is required. Therefore, it is questionable whether "100% domestic production" of a product is indeed a very meaningful concept today.

This policy probably was helpful in promoting a general awareness of increased domestic content, but at the same time it has caused an imbalanced industrial structure by encouraging the development of industries performing mainly the final stage of production such as the simple assembly of parts.

In these restricted sectors of the industry this policy encouraged the enterprises to obtain new technology from abroad (or in the best case develop it on their own), even when economically it was less profitable than importing the products.

By placing the major responsibility for domestic production on the users of the parts rather than on the producers, the policy probably encouraged the production of parts within a firm instead of relying on a parts-supply industry. Therefore, the industries that produced parts and intermediate goods did not develop freely.

The instrument probably encouraged the low quality and high price of certain products by overprotection through import restrictions and tariffs. This instrument can actually be used by an enterprise as a means of obtaining a monopolistic position.

By insisting on maximum domestic content with 100% as the ultimate goal in the near future, the instrument can produce various undesirable effects such as high cost and worsening of the balance of payments. Sometimes it could be more desirable to import certain parts that can be imported more cheaply in the foreseeable future. This instrument could have encouraged overinvestment in production capacity and the purchase of raw materials, which most often required the use of scarce foreign currency.

## ARGENTINA

### Law on the Reconversion of the Automobile Industry

Law 19,185 on the reconversion of the automobile industry was designed to achieve the following objectives:

- a gradual drop in the price of vehicles in the domestic market;
- the concentration of the assembly and autoparts industries to obtain higher productive efficiency with the maximum possible economies of scale;
- an intensive proportion of domestic technology and design;
- a decrease in the country's outflow of foreign exchange for the importation of goods or technologies for the said industry, with the resulting increase in domestic added value;
- significant and permanent exports of vehicles and autoparts;
- consolidation of national capital, with the real decision-making power in the autoparts industry.

The beneficiaries of this Law are the automobile manufacturers and domestic enterprises manufacturing autoparts. For its operation, the Law makes use of a mechanism consisting of the supervision of the participation of domestic capital imports and exports, the type of production, investments, and technological policy in the automotive sector.

In the autoparts industry, domestic enterprises enjoy the following benefits: special credit lines from the National Development Bank for fixed assets, investments, technological development, working capital, or mergers; preferential treatment in credit

policy measures applied by the BCRA, and preferential treatment in the state's purchasing policy.

The use of standardized and unified autoparts was to be mandatory in the automotive industry. Standardized autoparts were defined as those that satisfied domestic quality, operation, and material standards. They are also unified if they can be used by several vehicles in common.

The constitution of new nondomestic enterprises is possible if there are no manufacturers, or for purposes of increasing exports of nontraditional products (and if during 5 years they guarantee to export 50% of their production, in which case they may import matrices, molds, and appliances for their manufacture).

In the assembly industry, automotive vehicle manufacturing firms that do not belong to domestic capital must satisfy the production quotas contemplated for the models then being built before launching new models. Matrices, molds, and appliances may be imported provided it is a new model for which 90% of the matrices, molds, and appliances necessary for its manufacture are manufactured domestically. The applicable tariffs are those in force.

Autoparts that may be imported must be approved yearly provided that they are not manufactured domestically or, if manufactured, that they do not satisfy minimum price, quantity, or quality requirements. Assembly enterprises may only import autoparts in accordance with the item above for no more than 4% to 10% of the FOB value of the type of vehicle.

For both the autoparts and assembly industries, vehicle or autopart exports were to enjoy a 50% tax refund, but had to be exempt from payment of royalties and franchises. A register of patents, trademarks, and licences was to be established. Those contracts that did not contain restrictive clauses and whose payments did not exceed 2% of sales were to be registered in it. After registration, the pertinent payments could be remitted abroad.

This is the first policy instrument (prior to Law 19,231, which creates the National Registry of Technological Transfer Contracts and Licences) that explicitly referred to the prohibition against accepting technological transfer contracts containing restrictive clauses and that set up a register of patents, trademarks, licences, etc. It made the decision to promote domestic technology and design more explicit.

Despite the fact that as regards its explicit technological content Law 19,185 is a pioneer law, its implicit technological content and the way in which it faces sector regulation are much richer.

Production level controls and the obligation to amortize each model adequately before going on to a new one, the obligation to use standardized and unified autoparts, the restrictions on the incorporation of new enterprises unless they meet export goals, and the restrictions on the importation of matrices and molds unless they meet some given domestic production objectives, are provisions that have an extremely relevant technological content. Through them, the incentive to develop domestic technologies is linked to a more rational structure than the one that would result (as at present) from the free activities of automobile enterprises following the guidelines of their head-quarter offices.

The statement regarding intensive promotion of technology, etc., is as vague in this instrument as in many other Argentinian policy instruments. However, legal provisions gave the state sufficient authority regarding the basic technological decisions of the entrepreneurs to allow it to encourage the generation of a demand for local technology.

This Law was repealed, which questions the viability of certain policy instruments that at least try to incorporate slight amendments into the rationality and dynamics of some given power structures such as the one embodied in the automotive industry.

#### Regional Industrial Promotion Instruments

Law 20,560 and its regulatory instruments form a legal system aimed at promoting industry and modifying its regional distribution. When promulgated, Law 20,560 made explicit the following objectives:

- to achieve a high rate of industrial growth;

- to harmonize industrial promotion objectives with the socioeconomic needs of the population;
- to protect the environment and adequate conditions of life from pollution as well as from the effects that may be suffered by individuals and natural resources as a consequence of industrial activity;
- to reserve industrial promotion for industries with domestic majority stockholdings;
- to favour production and full employment rather than capital;
- to encourage import substitution and to favour the exporting sectors;
- to improve industry's cost structure;
- to assure the development of national defence industries;
- to support the expansion and strengthening of medium- and small-scale firms;
- to create conditions favourable to investment and industrial capitalization;
- to guarantee dignified and adequate standards of living to the personnel employed by the respective enterprises;
- to achieve geographic decentralization of industrial activities, promoting the settlement of basic industries in development areas;
- to give special support to industrial installations in frontier areas to consolidate the settlement and permanence of the population;
- to establish complementary and support activities with boundary countries whenever geo-economic conditions make it convenient;
- to avoid internal migration by contributing to the attainment of increasing labour employment levels;
- to promote maximum use of natural resources by processing them in their zone of origin.

The so-called priority industrial sectors - forestry and cellulose foods, animal and vegetable products and processes, mineral products, metalworking, chemicals, packaging in general, etc. (all of these sectors are broken down per product) - can benefit from Law 20,560. Other sectors that are not of a priority nature in other regions and that satisfy some given requirements can also benefit from it, as well as industries already established that have substantial expansion plans for their production capacity.

The mechanism used by the Law can be direct state contributions, state participation in the firms' capital stock, facilities for the supply of raw materials or for rendering the services, the purchase and rental of goods, and prices and rates to develop and encourage investments in infrastructure works. Also, these mechanisms include technological assistance, credits, tax exemptions, and imports of new or used molds and matrices for one year.

Later on, Decree 713/73 for industrial promotion concerning Law 20,560 was promulgated to set down the common guidelines that must be followed by sectoral, regional, and special decrees to be given as a consequence of Law 20,560. The main beneficiaries of these regulations are industries that are potential exporters or that could potentially compete with imports. Therefore, the main objectives of this body of laws is to discourage the development of new activities within the radius of the federal capital, as well as the promotion and settlement of industries in other regions of the country.

To achieve these objectives the two laws offer a series of incentives to enterprises to be localized in the promoted areas, provided they employ a given number of workers, use local raw materials, assign a certain percentage of their production to exports, or a combination of some of these requirements.

The laws are rich in statements about the major technological objectives sought through their application. More explicitly, and in keeping with the regulations, each decree approving an industrial localization agreement must define the source and the characteristics of the technology to be used by the promoted enterprises. However, as part of the research work undertaken by the Argentinian STPI team, over 40 localization contracts were sustained and none of them had any reference to the technological characteristics of the localization, nor any formal request for technological assistance for the installation or operation of the new plant.

Although this explicit objective was not achieved, the laws had a potentially very rich implicit technological content. To achieve the objective of maximum exploitation of regional raw materials with high levels of efficiency (despite the small size of the enterprises localized) requires an adequate selection of the basic technologies



required as well as continuous technological support. Otherwise such an objective would be postponed, within entrepreneurial logic, by the desire to use the instruments as simple elements to obtain the special benefits offered by them.

This last aspect should be analyzed in the light of short-term political requirements within which a body of instruments of this nature is incorporated. The fundamental objective is to promote the localization of industries in the interior of the country; technological development objectives, which imply longer-term decisions and for whose implementation a whole technological policy planning and execution structure that does not exist in the country is required, must be subordinated to it. Therefore, and on the basis of the logic for the priorities that the political environment sets up for government action, the technological deficiencies that can be observed may be understandable.

## INDIA

### Fifth Five-Year Plan for the Telecommunications and Electronics Industry

This section includes some notes on India's plan for telecommunications and electronics, even though it is much more than a limited "programming" mechanism. In this case an entire industry is being shaped by direct government intervention, planning all its aspects, including R&D.

The Planning Commission of India set up a Task Force in 1972 on the telecommunications and electronics industry, at the instigation of the Steering Group on Engineering Industries. The Task Force concerned itself with the broad area of formulating policies and programs relating to the overall plans of various sectors of the electronics industry. It operated through eight working groups in the following areas:

- consumer electronics
- mass communication
- telecommunications
- aerospace electronics and communication
- radar and defence systems
- computers, controls, and industrial electronics
- instruments and instrumentation
- components and materials.

Based on the Task Force report, the Department of Electronics prepared in July 1973 the draft plan for electronics for the Fifth Five-Year Plan. Two profiles, a total profile and a difference profile, were prepared as part of the Fifth Plan document. In the total profile, the electronics activities included in the plans of the Ministry of Communications, the Ministry of Defence, the Ministry of Information and Broadcasting, the Ministry of Industrial Development, the Ministry of Civil Aviation, the Atomic Energy Commission, and the Space Commission were also included. Thus, this profile gave the total profile of electronics activities in the country under various ministries and departments. In the difference profile, all the activities proposed to be started under the Department of Electronics were enumerated.

A Trade and Technology Liaison Committee to handle the import and export trade between India and East European countries has already been started as a corporation called Electronics Trade and Technology Development Corporation (ETTDC). Apart from carrying out import and export trade in electronics between India and East European countries, this corporation in the public sector has also built an information base and has streamlined technical procedural difficulties encountered in this trade.

Another activity that is to be commissioned shortly is in the area of semi-conductors. In view of the rapid technological advancement in the semiconductor devices area, the need for a new semiconductor devices complex in the public sector dedicated to the production of these devices was recognized. Along with the production activities, it was recognized that R&D in semiconductor devices involving high-level technology (e.g., MOS-LSI technology, LED technology, SC memories, high-density packaging technology, etc.) was also necessary. A complex for the production of these devices and for carrying out R&D is to be set up shortly.

Yet another activity that is soon to be started is a corporation for computer maintenance. The Electronics Commission has advocated the setting up of a centralized maintenance agency for all imported computers in the country. This is designed to build up self-reliance in the maintenance of systems and to carry out system engineering

improvements.

A list of the important manufacturing and promotional activities that were to be initiated in the Five-Year Plan is given below:

- custom manufacture of special tubes
- CPU and peripheral controllers
- basic peripherals
- software development
- automation promotion centre
- promotion of control components
- production of microwave components and instruments
- custom production of capital equipment
- two-way communication equipment
- test and development facilities
- standardization activities
- state agency for rural market promotion
- high-technology and medical electronics instruments development production.

#### INDUSTRIAL FINANCING MECHANISMS

In the STPI country studies, a great deal of attention was given to the banking system and other financial mechanisms (funds, specialized credit, leasing companies, etc.). The reason for this was the overwhelming importance that financial mechanisms have as tools for industrial development and therefore as potential instruments for the promotion of indigenous scientific and technological capabilities. The specific cases summarized in this section are:

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| Mexico    | - National fund for industrial equipment.<br>- National fund for industrial promotion.<br>- Fund for guarantees and promotion of medium and small industries.<br>- National fund for preinvestment studies.<br>- Fund for the study and promotion of industrial complexes. |
| Venezuela | - Development of long-term credit.<br>- Leasing companies.   |
| Brazil    | - National Economic Development Bank (BNDE).<br>- Basic Inputs S.A. Financing and Participation (FIBASE).<br>- Brazilian Investment S.A.<br>- Special Agency for Industrial Financing (FINAME).<br>- FINEP: Institution for the financing of projects and studies.         |
| Korea     | - Financial mechanisms for industry.   |
| Peru      | - Development Finance Corporation (COFIDE).<br>- Industrial Development Bank.<br>- Mining Development Bank.  |
| Argentina | - Permanent national fund for preinvestment studies.   |

The main role of these industrial financing instruments related to their possible impact on the pattern of industrial growth and hence on the demand for local technological inputs. They can be considered as the most powerful instrument when the state controls their operations, in particular when dealing with large projects that go beyond the financial possibilities of a given enterprise or group of enterprises (and even beyond the possibilities of individual banks). Their role can also be equally decisive and powerful by reorienting demand for engineering services and industrial R&D toward local suppliers and by establishing norms for credit operations that include clear and practical considerations regarding the regulation of technology imports.

Inflation and scarcity of capital in many developing countries have led many researchers to believe that capital is underpriced, that the current - and often directly or indirectly subsidized - interest rates do not reflect the real cost of capital, and therefore that the tendency to replace labour by capital is much more accelerated than what it would be if the real price of capital were established. The problem with this argument is that it does not take into account that such subsidized interest rates were

one of the keys for the industrialization of the developing countries, and that the average interest rates of world capital markets normally tend to be even lower. It is also generally recognized that labour costs are subsidized by several channels. The substitution of capital for labour in such a context is nevertheless the dominant tendency and cannot be considered, by itself, a negative tendency.

This tendency of the developing countries to have higher real interest rates than the developed countries also appears in countries like Venezuela, where the massive oil income of 1974-1976 clogged the economy. Venezuela has encountered many difficulties in the development of a long-term capital market. This demonstrated that the availability of money in itself is not sufficient, for it needs to be transformed into a rather complex mechanism to foster industrial development. This transformation faces considerable obstacles in the developing countries.

In general, the use of industrial financing instruments in the STPI countries analyzed has not been as imaginative as it could have been and has conformed to rather conservative financing evaluation criteria of the banking type. There are few examples of a clear orientation of the financial strength of the State (and of large private finance corporations), in terms of the sectoral priorities of the instruments, as well as their discrimination in terms of nationality, size, and technological inputs of the beneficiaries. There are even fewer instances of the conscious use of industrial financing instruments to foster the development of indigenous technological capabilities.

In addition to their contribution to the formation of a given industrial structure, industrial financing mechanisms are also very important because of their potential effects on investment decisions in industry through the qualitative considerations they can impose as conditions for obtaining credit. In none of the cases studied was this potential effectively used. When considerations as to the source of the technology, the degree of national integration, and the effects on employment, environment, etc., were taken nominally, it was recognized that in practice such considerations were not actually considered. Immediate, short-term profit considerations have usually prevailed over broader social objectives.

An important gap in all the STPI studies is that there has been practically no mention of the overwhelming foreign debt situation of the developing countries, which has grown considerably in the last 5 years, and which has affected some of the STPI countries in particular.

## MEXICO

The participation of the Mexican state in industrial financing has had two basic orientations: selective control of credits granted by the financial system; and direct intervention in obtaining savings and channeling them toward the formation of capital.

Through the regulations of the Central Bank, there has been an attempt to direct credit toward productive activities (primary and secondary sectors) since the beginning of the 1940s. In fact, at that time, a rule was established requiring that at least 60% of the portfolio of all banks and financial firms would be destined for loans for industrial and land-and-livestock production. As a result of this disposition, the share of these activities in the total sum of credits rose considerably, reaching levels higher than 40% and 53% in 1970 and 1975 respectively. However, these dispositions are too general and do not set priorities within these sectors. Thus, the consumer goods industries absorbed more than half the credits to the manufacturing industry in those years (7), and a great part of these credits served to finance inventories and sales.

Moreover, in addition to the absence of sectoral priorities, these measures did not indicate an orientation in terms of the type or size of corporations that should receive credits. In general, the largest firms absorbed a higher proportion of the credits to industry. The guarantees they offer to the local loan agent are greater than those of the small and medium firms. Of course, this applies with greater emphasis to the subsidiaries of transnational corporations that have intensified their use of local sources of credit to finance their operations in recent years. And the largest corporations are precisely the ones that have greater possibilities for obtaining finance.

In short, the selective control of credit exercised by the Central Bank has not directed the financial system toward sectoral priorities in industry or agriculture. The

level of self-financing in industry was also quite high (it has been calculated at 60%, owing in good measure to the fiscal stimulus to reinvestment), and instruments to orient it do not exist. The greatest part of industrial financing is therefore made in accordance with the pattern of expected profitability of private enterprises (and therefore, with the pattern of concentration of income).

The orientation of credit to industry has not considered criteria regarding the choice of techniques. Although credits that could result in increases in employed personnel are difficult to obtain because of lack of guarantees (loans to augment the working capital of small and medium industry), those that may have a bias in favour of capital-intensive techniques are obtained with relative ease (loans for the purchase of machinery and equipment for which the capital goods acquired with the credit can serve as a guarantee for the creditor).

One of the elements that contributes most to undervaluation of the price of capital is that interest on borrowed capital is deductible from the taxable total. In 1975, public banking was responsible for 42.8% of the total financing of companies and individuals (channeling more than 121,831 million pesos). An important part of this total corresponds to credits granted by special funds constituted as trust funds in the Bank of Mexico and in the Nacional Financiera. An analysis of some of the most important trust funds is presented next.

#### National Fund for Industrial Equipment (FONEI)

FONEI, a fund in the Bank of Mexico directed toward financing projects for import substitution or for increasing exports, was established at the beginning of the current decade. Like the other funds, FONEI operates through the private banking system, granting credits for amounts that fluctuate between 3.5 and 37.5 million pesos at an interest rate of 12% and for terms of up to 13 years. Private banks receive 2% on the operation for serving as intermediaries. The user must present an investment package in which the shares of the user itself, the financial intermediary, and FONEI are as follows:

	<u>New Projects</u>	<u>Modernization or Expansion</u>	<u>Feasibility Study</u>
Industrial Firm (minimum)	25%	20%	20%
Financial Intermediary (minimum)	10%	8%	-
FONEI (maximum)	65%	72%	80%

The financing must be directed toward the following types of projects: installation or equipping of industrial plants; and plant expansion or modernization if and when the products have reasonable possibilities of being placed in foreign markets or of serving as import substitutes. Feasibility studies related to projects subject to being supported by FONEI can also be financed. The industrial branches for which financing can be granted are capital goods, intermediate products, and basic consumer goods (those that are consumed by a high percentage of the population or that are considered indispensable for the economic development of the country).

The criterion regarding the composition of the firms' equity is sheer formality: it insists that companies have a majority of Mexican capital (thus, preferential credit might be granted to a firm with 49% foreign capital). More than 36% of the companies receiving credits from FONEI up to May 1975 were subsidiaries of transnational corporations and had received 38% of the total resources channeled through this instrument.

The number of jobs created with the credits received by the transnational firms is much lower: generally, the industrial projects of these companies involved a greater capital intensity.

In approving a credit, FONEI considers the following elements: generation or savings of foreign exchange, use of labour, value added, industrial decentralization, legal organization and technical capability of the firm, profitability of the project, market conditions, financial situation of the firm, technology to be used, sources of raw materials, and alternative sources of resources. However, the internal rules of FONEI do not specify how these elements are evaluated.

The technology used in the projects may or may not be foreign, the firm may or may not carry out research and experimental development activities, etc. Moreover, the criterion on industrial decentralization is applied in an extremely flexible manner;

51% of the approved projects involved locations in Zone I as defined by the Decree on Decentralization and Experimental Development. Finally, as with the majority of the financing instruments, the evaluation of a project is completed on the basis of its micro-economic rationale.

#### National Fund for Industrial Promotion (FOMIN)

FOMIN was created in April 1972 as a trust fund administered by the Nacional Financiera. The initial apportionment from the federal government was 50 million pesos. FOMIN functions by means of the purchase of common or preferred stock in an amount not exceeding 33% of the new equity of the firm. Thus, the Fund participates like one more partner of the firms it supports and to which it offers the technical, administrative, legal, and financial assistance made available by the Nacional Financiera. The entrepreneurs can buy the stocks controlled by FOMIN. Finally, when the contribution of the Fund is greater than 1 million pesos, performance of a technical and economic feasibility study by the National Fund for Preinvestment Studies (FONEP) is required.

Its goals are the following: to strengthen regional development by furthering industrial decentralization, to create new sources of work, to better the situation of the balance of payments, to promote the generation of national technology, and to contribute to a greater integration of the industrial plant. Priority is given to firms that process agriculture and livestock, forestry, fishing, and mining products. Furthermore, the following scale of priorities has been set for selecting projects:

<u>Type of Firm:</u>	Small and medium, with national capital;
<u>Location of the Firm:</u>	Zone III and Zone II (which exclude the Federal District, the city of Monterrey, and the city of Talisco);
<u>Destination of Production:</u>	Indispensable consumption industries, export industries, import substitution;
<u>Technology and Employment:</u>	Locally created technology, foreign technology adapted to local conditions, or technologies that might offer greater employment.
<u>Industrial Branch:</u>	Land-and-livestock and related industries, chemical products, metal mechanics, construction materials, electric and electronic products, textiles, wood.

Although these priorities could be complemented and some of the criteria are incomplete, this instrument is the first to define priorities in terms of industrial branches. In general, the application of resources has been regulated by the established criteria and priorities. Still, the concentration of resources in a few corporations is quite intense. Five firms (7% of all those that had received credits from FOMIN) absorbed more than 31% of the resources channeled through this instrument (more than 56.7 million pesos).

#### Fund for Guarantees and Promotion of Medium and Small Industry (FOGAIN)

FOGAIN was created in 1954 for the purpose of channeling resources to firms that had no access to sources of credit because of their size. Financing from FOGAIN is reserved for companies whose equity is less than 25 million pesos if they are located in Zones II and III (defined by the Decree on Decentralization and Industrial Development). The Fund was formed with an appropriation of 15 million pesos from the federal government and, since beginning its operations, has dealt with 17,173 applications for credit for a total amount of 4,614 million pesos channeled to more than 9,000 firms.

According to official figures, 57% of the total financing was granted to firms producing consumer goods, and 43% was channeled to companies in the branches of intermediate products and capital goods. The credits are used basically for the acquisition of machinery and equipment. However, criteria on the technology used or the technical activities developed by the companies that benefit are not applied by this Fund. Once again, the principal criteria are the profitability of the firm and the guarantees that are offered.

FOGAIN applies differential interest rates according to the location of the firm: 12% on credits for companies located in Zone I; 11% and 10% on credits for firms in

Zones II and III respectively. But the Fund maintains a passive attitude toward the different industrial branches and zones of the country: applications for credit are received even though no active policy has been developed for identifying projects in some top-priority branches. The industrial branches that have benefited from FOGAIN credits simply reflect the changes in the industrial structure of the last 20 years.

#### National Fund for Preinvestment Studies (FONEP)

FONEP was started when the Nacional Financiera began to require feasibility studies before granting credits. The Fund was created in November 1968, and since then has authorized 87 operations at a value of 176 million pesos. FONEP seeks to finance these studies and has a fund of 364 million pesos for this purpose. The studies financed by this Fund are the following:

- technical and economic prefeasibility and feasibility studies of specific projects;
- specific complementary studies (engineering design, etc.);
- preliminary studies aimed at identifying, approving, or rejecting alternatives viable from an economic or technical point of view which might facilitate making a decision on the advisability of a project or group of projects;
- general prefeasibility studies of a regional or sectoral nature; and
- studies aimed at improving the administrative, operational, or productive capacity of private companies and firms from the public sector.

From the beginning, the resources handled through FONEP have benefited organisms in the public sector (government and the decentralized agencies). Fifty-one percent of the operations concern firms in the industrial sector, 15% in agriculture and forestry, and 24% in services.

FONEP has available a directory of consultants who can be contracted by companies receiving credits. Many companies offering such consulting services are foreign; to date there has been no policy on hiring national firms. The capacity to perform technical and economic feasibility studies in almost all branches of activity exists in Mexico. If they do not have the capacity in some branch, they can subcontract to external consultants. But generally it can be argued that hiring foreign firms to conduct these studies is not justifiable. Besides, a feasibility study frequently makes recommendations on suppliers of technology, of engineering services, and of capital goods; as far as possible, the chance that foreign consultants might orient the demand for these elements to foreign sources should be avoided.

#### Fund for the Study and Promotion of Industrial Complexes

This Fund was created in December 1970 with an initial appropriation of 5 million pesos. The purpose of the Fund is to study the possibilities of creating industrial complexes and their promotion. Once the infrastructure of an industrial park is constructed, the financing of land sales is carried out through the Fund.

Through establishment of an industrial complex, firms can have access to the centralized services of an infrastructure (from water, sewage, paved roads, and electric power to residential areas, telecommunications, and computer centres). In addition, certain services can also be acquired or contracted for in a centralized fashion: financing, commercialization services, etc.

It is quite difficult to analyze the impact of this instrument on the technological decisions of the companies established in the industrial parks. However, in the majority of the industrial parks, the services of commercialization and financing have not been centralized. Nor is it very likely that in the near future centralization can be promoted for technological research or technical activities (maintenance, quality control, or training of labour).

The common characteristic that all Mexican trust funds share seems to be the lack of specific sectoral priorities. Another one is their failure to distinguish between various types of credit-receiving firms (particularly with reference to the composition of their equity). The majority of the trust funds do not exert any criteria about the origin of the technology employed by the beneficiary firms or about the conducting of research or technical activities.

The final destination of the credits scarcely seems to concern these trust funds. The interest rate is the same regardless of how the credits are used (for acquiring fixed assets or expanding working capital). A difference in the interest rates applied to agencies in the public sector and to private enterprises does exist, but these are preferential rates, much lower than the rate applied by the private commercial banking system (18% to 19% in 1975). Consequently, the concession of these credits implies a subsidy to the beneficiaries whose benefits are not easy to identify.

More and more, the transnational firms apply to local sources of credit to finance their expansion: their contribution of resources is worthless in this case and contrasts strongly with the flow of profits that will be remitted abroad as royalties. In this context, conceding credits with preferential interest rates to transnational firms constitutes an economic folly.

The federal trust funds ought to incorporate substantive criteria over the use of credits and the technical characteristics of the beneficiary companies. In the first place, the sectoral priorities of these instruments ought to be determined. Investment projects should be actively identified, and the system of differential rates should discriminate against branches or sectors that are not high priorities. Moreover, the choice of technologies must be shaped as far as possible. Also, criteria should be applied based on the level of integration (as FOMEX currently does) and on payments for imported technologies. With the application of these and other criteria, the excessive weight given at present to criteria based on the microeconomic rationale of the beneficiary firms might be counteracted.

Finally, payments for interest on credits for corporations should not be deductible from the taxable total (for income tax). This is a measure that unnecessarily cheapens the cost of capital and that reduces the tax base of the firms.

## VENEZUELA

Among the instruments affecting the technological behaviour of the industrial sector, those that finance the acquisition of technology are particularly important. In Venezuela two elements are important: on the one hand, the country's dependence on the supply of foreign technology, and on the other, the specific economic conditions resulting from the production of oil.

In this context the Venezuelan study tried to define the role played by foreign credit in financing the importation of technology and, in parallel, to explore the possibility that internal credit develops a more significant role, which might have the associated effect of improving the negotiating capacity of the national buyer.

First, it is necessary to examine whether the national banking system can be an alternative to foreign financing and more specifically whether the considerable resources derived from oil can be converted into finance capital for new investment projects. The reply to this is of central importance given that the bargaining position of technology buyers is visibly weakened when they depend on external financing.

### Development of Long-Term Credit

In Venezuela finance capital does not come from the evolution of an autonomous economy, but is the result of the penetration of foreign capital, and especially of its appropriation of part of the ground rent (agrarian and oil). Strictly speaking, accumulation of this type does not give rise to finance capital but to money capital (8).

National financing conceded through private commercial banks, mortgage banks, finance associations, loans and savings institutions, state banks and funds, and state financial corporations has been oriented predominantly toward commercial and mortgage activities, which compared with industrial or agricultural activities are far safer and allow higher profits in a shorter period.

This orientation also corresponds to public financing organizations, which according to a study carried out by the Venezuelan Development Corporation (CVF) have not covered the deficiencies in the private system and have tended instead to follow the same patterns with respect to interest rates, terms, and credit distribution between regions and sectors of the economy.

National banks operate without paying heed to technology policy. The nature of

the technology, where it comes from, the conditions in which it is acquired, local technological capacity, etc., are all of no relevance to Venezuelan banks. Even the public financial entities behave in a similar manner, although they do have some norms regarding the use of technology. These norms, however, are expressed in a very general manner - "technology that promotes the use of national raw materials" and "technology favouring the use of labour" are two such vague norms that are practically impossible to put into practice. Private banks are even further away from including elements of technological policy as criteria for their operations. In this case the profit criterion dominates absolutely and excludes any other considerations. It is important that since private banks directly administer part of the state's financial resources - by means of the funds, basically - profitability becomes the only criterion for the investment of these resources.

As a first approximation, the role of foreign banks can be estimated by comparing the conditions under which they concede loans with those of national banks.

The normal interest rate in the internal market is 11% a year on debit balances. This rate is used by the mortgage banks, commercial banks, finance associations, and the CVF in the case of warranties. Regarding the Industrial Credit Fund (FCI), the major part of the credits has been conceded at 8% and 9% (only a minimal number at 6% or less). Meanwhile the current interest rates in the international market fluctuate between 6.5% and 8.5% (apart from the fact that they are frequently subsidized by the government of the country from which the credit comes).

The commissions charged in the internal market are generally higher than those in the international market. In the first case, they vary between 0.5% and 5.5%, leaving aside the savings and loans associations where commissions are higher. In the world market, the commissions oscillate between 1.5% and 2%.

In Venezuela long-term credit is just beginning to develop and has existed only in mortgage loans and recently in the case of the FCI (in principle, for 65% of its loans). The recently formed finance associations dedicate only a very small proportion of their funds to long-term operations and then only as commissioners of state funds.

Foreign banks, on the other hand, have resources for any type of credit, although it should be noted that long-term credit has recently been getting scarce and has been covered by short-term renewable rotating credit.

In the international market far more importance is given to guarantees conceded by the state either directly or by means of participation in the share capital of the firm receiving credit, or through a commitment to an increase in state participation, should financial difficulties arise. Foreign loans normally allow up to 3 years remission period and sometimes up to 5 and 7 years. In the internal Venezuelan market only the Agricultural Credit Fund (FCA) offers a period of remission for the most backward areas of the country, and the CVF in the case of warranties allows 1 to 5 years.

Loans obtained in the internal market normally cover 75% of the investment. Commercial banks give short-term loans with the warranty of credit notes and cover up to 90%. The international market, on the other hand, lends up to 100%. Internal credit is very specialized and is oriented toward commercial and mortgage activities. Thus there is a scarcity of credit for industry and agriculture. This is not true of external credit.

Finally, it must be pointed out that the national credit system has difficulties in fulfilling the schedules for investment capital, something that does not occur in the international system. In general it can be said that the larger the capital required and the more relevant it is for industrial (and technological) development, the less adequate the nationally supplied credit is, and the more the interested firms have to resort to foreign credit tied to a number of inputs (hardware and software).

The relative scarcity of long-term capital does not have only historical causes. The current central problem that serves as an obstacle to the development of long-term capital is inflation. At the same time that the large resources derived from oil appeared, inflation accelerated. The inflation rate is now higher than the interest rate and therefore the latter is becoming negative. In Venezuela there is no system for indexing debit balances. The foreign exchange surplus derived from oil exports, on the other hand, is not easily made available in the internal market. Apart from other factors, this surplus behaves as capital; this means that it seeks high and guaranteed profit rates, which it looks for in the international markets.



According to the Superintendency of Banks, a large proportion of the capital derived from 1974-1975 oil exports was exported to the eurodollar market, that is, to the short-term international capital market. It is thus not easy for this money-capital to be transformed into large sums of long-term credit for the international market. Moreover the national banking structure has not been adapted for this transformation. Venezuelan banks are very specialized and the finance associations are very recent. Commercial banks are totally inadequate for such purposes. The fact that the state increasingly has to use external credit to cover an important part of its financial requirements is perhaps the best evidence of the difficulties of transforming its euro-dollar deposits into long-term credit.

In Venezuela there are no organic links between banks, industries, and technology suppliers. Such links become essential for the large credit operations with long-term capital, where competing firms operate with "package deals" in which the technology suppliers are intimately associated with the financial system. On this point the remarks of Rudolph Petersen, President of the Bank of America until 1969, are very illuminating. "At the moment, the cutting edge of international banking activities is found in the capacity to bring together capital, loans, resources and knowledge into an integrated block and to provide the necessary means for these ingredients to flow across national frontiers."

Technology suppliers frequently offer financing as part of their package. These firms are clients or subsidiaries of banks and have a privileged and open credit line with the bank for carrying out their operations, and often - as in France - they do so with the guarantee of the government of the country in which the parent company is based.

In summary, the comparative advantages of external credit - leaving aside the relative scarcity of internal resources for long-term credit - are due precisely to the packaging of foreign investment (direct or disguised investment) with the commercialization of technology. The profitability of financial-commercial operations is not established exclusively on the banking operation as such, but on a whole complex of operations. Involved in this is the interest of the governments of the countries where the parent company of the foreign bank or firm is located in promoting and protecting their national companies, especially in the current circumstances of accelerated worldwide commercial competition. The possibility of thus allotting the profit rate and compensating through trade or technology the reduction of interest rates (or vice versa) is prohibited at the moment for national banks. Having indicated the importance of foreign banks and their advantages over national banks, the conditions in which foreign banks operate in Venezuela are considered next. The Venezuelanization of banks established recently by the Banking Law has two fundamental characteristics:

(1) Foreign banks in Venezuela cannot operate independently but are obliged to operate through a national bank or a representation bureau previously authorized by the Superintendency of Banks. According to the law the offices of representation cannot receive any sort of deposits or intervene in operations that in any way imply obtaining internal resources.

(2) The representation bureaus do not directly concede credits but negotiate operations with interested persons. However, these measures, which are part of the Cartagena Agreement policy, have not eliminated foreign banks as financial instruments.

On the one hand, regarding short-term credit operations (importations), foreign banks open credit lines that are not limited in their scope by any internal legislation. The only limit is the bank's own financial possibilities. On the other hand, no legislation prohibits a local firm from obtaining credit in the international market and paying off the loans in the same market. This can be done apparently without any legal requirement for internal control because there is no exchange control. This allows the development of hidden forms of foreign investment by international banks.

On the basis of all that has been said, the Venezuelan team made recommendations directed toward increasing the possibilities of the use of internal credit as an instrument of technological policy to improve the manner in which imported technology is acquired and to stimulate local technological capacity. To this end the following areas of action were suggested:

(a) The preamble of the Project of the Law creating the Technology Bank should be revised to widen its radius of action, especially regarding the availability of credits for the disaggregation and depackaging of the technology to be imported, for the

international search, selection, and evaluation of technology, for the selective importation of technology, and finally for financing the acquisition or experimental development of national and Andean subregional technology.

(b) Complementary norms and guides should be drawn up for the projects seeking financing presented to banks (state or private), incorporating as evaluation criteria items regarding the technological policy of firms seeking financing so as to judge the adequateness of their policy in terms of national economic and technological development policy.

(c) A proposal should be studied for creating credit lines in banks, which, similar to the obligatory 10% for agriculture, establishes a minimum percentage for the development of scientific and technological activities in the widest sense of the term, in conditions at least competitive, or better still, advantageous compared with external credit.

(d) The systematic use of the funds of the FCI and the FIV should be promoted as substitutes for external credit in operations of technology purchased abroad. Strict criteria should be used, which include adequate depackaging and which assign priority to the acquisition of locally generated technological inputs.

### Leasing Companies

Because of their special characteristics, the leasing companies recently established in Venezuela are dealt with separately.

Leasing companies perform financial operations that involve renting out equipment, machinery, and durable consumer goods that the lessor has the option to buy. As a financial operation this has recently been incorporated into the national Banking Law, although regulations regarding functioning have not yet been drawn up.

The leasing companies used to buy the machinery that the client required and then rented it out to him, generally for not less than 18 months or for more than 5 years. However, because of recent government measures (25-5-76) aimed at restricting money supply, renting out for periods longer than 18 months is now not permitted. The loan normally covers the total cost of the machinery or equipment. The lessee pays a monthly rental payment fixed by the lessor on the basis of the cost of the equipment, its degree of obsolescence, the risk implied, and the agreed terms. The principal advantage for the lessee is that he does not have to mobilize large amounts of capital immediately or make advance payments. The lessee can deduct the rental fees directly from his taxes. Leasing companies have generally been promoted by national banks and through them, by foreign banks and probably foreign commercial concerns.

In a survey of a few leasing contracts, the Venezuelan team was able to establish some common features, which are briefly described below.

The company that leases the equipment normally takes responsibility for all the expenditures on repairs, maintenance, spare parts, or equipment improvements, but the lessor has ownership of every new part or improvement introduced to the leased equipment, with no possibility of recognition of what would be the equivalent of "land or house improvements."

The lessee is obliged to pay the lease even when he has not used the equipment and has denounced the contract, requiring it to be terminated. Payment is obligatory while the lessor maintains that the contract is legal. The lessee is made responsible for all the expenses incurred for freight, duties, transport, delivery, storage, insurance, and others, but has no right to determine where the equipment is to be installed. The lessee is responsible for all the expenses incurred for personnel training, third-person accidents, professional fees, and legal and administrative costs, and is obliged to submit his balance sheet to the lessor, who can carry out audits if he so wishes and "verify the administrative norms" of the lessee. The expenses thus incurred are paid by the lessee. The lessor usually does not accept in the contract any responsibility for faults and defects that the leased equipment might have, or the consequences these imply.

The recent government decision to prohibit operations of this sort for periods longer than 18 months will probably restrict the rapid expansion these firms had been enjoying. However, since the government's measure can be modified and probably evaded, and since important investments have already been made in this way, it is necessary to

examine the consequences of these firms from a technological point of view.

To begin with, it is important that the operations of the leasing or hire-purchase companies are themselves very similar to a foreign investment, even though the firms themselves may be legally national. As a whole the leasing operation is not easily distinguished from a foreign investment accompanied by loans and tied to the importation of inputs and machinery (thus, of "embodied technology" sold as a "black box"), with controlling rights over the lessee's balance sheets and with administrative practices very similar to those of a parent company in relation to its subsidiary.

The leasing companies act in practice as representatives of banks and foreign industry, as intermediaries in financial and commercial operations. Free from the restrictions imposed by Decision 24 of the Cartagena Agreement and the corresponding Venezuelan national rulings, and effectively free from practically any legal control, the leasing companies attend to their clients' needs, carrying out all the financial operations and purchases required, deciding for the client all the details of the operation, and advising in the selection with great bargaining power.

Once the lessee has signed the leasing contract, he has practically renounced all possibility of autonomous decision-making. The leasing company has the right to determine the location of the machinery, how it is to be used, and its maintenance. The lessor appropriates any improvements introduced to the leased machinery and equipment and has the right to control the accounting and financial operations of the lessee. It also has the right to decide whether the lessee can acquire or lease new equipment or machinery and to impose conditions on these operations.

Apart from the fact that this is by definition a technological package, the current contractual norms explicitly forbid any maintenance or repair of leased equipment and machinery by the lessee. These operations serve as an elementary basis for technological learning.

Leasing operations have strong effects on the use of capital-intensive technology in that the expenses incurred by the lessee are income-tax deductible; thus capital costs are considerably lowered.

All the points discussed indicate the existence of strong disincentives for technology disaggregation in leasing operations, and on the other hand, strong incentives for indiscriminate technology importation. In addition, since the lessor appropriates all the improvements introduced into the leased machinery and since the lessee is obliged to accept the lessor's control over additional new equipment he might want to acquire or lease, the lessee has no incentive to become interested in his own technological learning or development; rather, technological apathy is induced.

Because the leasing companies have been operating for only a short time in Venezuela and their effects are only partially known, a more detailed analysis should be made to recommend measures that might fill the current vacuum regarding knowledge of their operations.

## BRAZIL

Up to the first half of the 1960s the inadequate financial system was one of the barriers to faster industrial growth in Brazil. Made up almost solely of monetary assets and bank debts, it offered no alternatives to inflation for credit expansion. Because of inflation and the legal limitation of the interest rate, credit was limited to short-term credit for the financing of circulating capital granted by the commercial banking network and to medium-term credit granted by the "financeiras" (i.e., credit and financing societies). Long-term credit for financing the fixed investment of industrial enterprises was practically nonexistent, in view of the fact that the National Economic Development Bank (BNDE) was mainly linked to the financing of investment in infrastructure (power and transport), steel, and chemical industries.

It was only after the reforms affecting the monetary system, the banking system, and the capital market introduced in 1964, and with the creation of special funds for medium- and long-term industrial financing, that a wide reorganization of the financial system was started, it being adapted to the needs of industrial financing. Although the implementation of those reforms was linked (in a long-term perspective) to the objective of containing inflation, it represented the institutional basis for most of the new

financial techniques and institutions, which, among other effects, encouraged industrial growth. The most important changes introduced as of the mid-1960s included:

(a) New specialized financial institutions were created, such as the ones making up the housing financial system and the investment banks.

(b) New techniques were introduced and the "financeiras" specialized in direct consumer credit (financing the commercialization of durable consumer goods). Medium-term financing of circulating capital was thus left to investment banks and regional and state development banks - which also work in "repassing" (i.e., as intermediaries) financing for fixed capital - and short-term financing of circulating capital was left to the commercial banks. The latter underwent a process of mergers and annexations, which aimed chiefly at reducing operational costs (increased by the excessive expansion of the banking network) and the cost of money for the final borrower.

(c) New regulations were introduced for modernization of the stock exchange markets.

(d) An important financial innovation, the "correcao monetária" (i.e., price indexation), was introduced and a flexible exchange rate was adopted.

The result of these changes was a marked alteration in the structure of the financial system, which can be assessed by the change in the relative participation of the assets in the hands of the public outside the banking system. The most important change is undoubtedly the loss of the position of monetary assets in the financial system, with the corresponding increased participation of nonbanking financial intermediaries, which has become prevalent since 1972. Although a large part of this was structural change, it gives an approximate idea of the diversification of sources of financing external to the enterprises. The promissory notes, after banking operations, became the most important source of credit for current activities, allowing the medium-term financing of durable consumer goods through the "financeiras" and of circulating capital for the enterprises through the investment banks. As to long-term loans for fixed investment, the domestic supply was increased with the creation of specific funds for industrial financing in the sphere of the public financial intermediaries (BNDE and the Bank of Brazil) and of the Central Bank, and, after 1969, with the inflow of loans and financing from abroad.

Among the several funds with a nationwide scope that were created or reformulated in the period (besides the regional and state development banks) the following should be mentioned:

(a) In BNDE: FRE (i.e., Fund for Economic Reequipment), which had previously financed investments in infrastructure (power and transport), steel, and chemical industries, thereafter granted credit to practically all branches of manufacturing; FIPEME (i.e., Fund for the Financing of Small and Medium-sized Enterprises); and FINAME (Fund for the Financing of Machinery and Equipment), which in 1971 was changed into a public enterprise subsidiary to BNDE and whose activity has been acquiring a strategic importance in the financing of domestically produced capital goods.

(b) In the Bank of Brazil: FINEX, FDI, FIRUM, FAD, FUNDIPRA, and PASEP.

(c) In the Central Bank: FUNDECE (Fund for the Democratization of the Capital of Enterprises); and FIBEP. These are funds of an accounting nature; in FUNDECE the financial agents are the Bank of Brazil and regional and state development banks, and in FIBEP they are the Bank of Brazil, BNDE, and FINAME S/A. There is also the PIS (i.e., Social Integration Program), which is a fund administered by the Federal Savings Bank and with an important role in the recent financing of domestically produced machines and equipment.

(d) In the National Housing Bank (BNH): REINVEST, which finances fixed investments for enterprises in the branch of building materials.

These funds have constituted the only sources of investment capital for industrial enterprises. The private financial system by itself offers no alternatives. Investment banks, which should work essentially in this sphere of credit, have most of their medium-term credit granted for circulating capital. "Underwriting" operations still mean very little in terms of the volume of resources. The market of primary titles of enterprises, on the other hand, is practically nonexistent for reasons dating back to the inflationary past and because of the natural preference for short-term titles.

Credit supply to the private sector has a very well-defined profile. Short- and medium-term credits for circulating capital are mostly supplied by the commercial banks, the Bank of Brazil (decreasingly), and increasingly by the "financeiras" and investment banks. Long-term credits for fixed investment are internally supplied solely by public agencies and official banks: BNDE, FINAME, BNB, BRDE, Bank of Brazil, and BNH (which finances house building).

From the viewpoint of the need for industrial financing, the fall in the participation of loans and financing contracts for circulating capital, together with the corresponding rise in the participation of those for investment capital, is still more important. This apparently would have benefited industrial investment, which even today is hampered by the shortage of long-term credits. Nevertheless, it should be stressed that the near totality of the rise in participation of the supply of investment capital can be explained by the growth of BNH loans and financing contracts, which have a specific destination. It is significant that credits from BNDE, FINAME, and, to a lesser extent, the Bank of Brazil have followed approximately the annual growth of the total credit supply. However, the domestic supply of long-term credits is still insufficient, especially in sectors such as the ones responsible for the national production of machinery and equipment.

It must still be seen in which ways the reform of the domestic financial system, as well as the creation of new funds for industrial financing and the new forms of collecting resources abroad, have stimulated industrial growth since 1967. It is obvious that the greater encouragement originated from the fact that the enterprises could count on new sources and a greater availability of resources. However, the most important changes affected short- and medium-term credits for circulating capital. Industrial growth began to benefit from the development of the financial system directly through the credits for circulating capital supplied by special financing funds linked to the public agencies, by the investment banks, which replaced the "financeiras," and chiefly by the new lines of credit abroad. Industrial growth benefited indirectly through the financing of the consumption of industrialized products (durable consumer goods) in which the "financeiras" specialized. As to long-term credits, the rise in their supply was restricted to public financial intermediaries (chiefly BNDE and regional and state development banks) and to the credits from abroad, the latter in a growing proportion. As was remarked above, the private financial system offers as yet no alternatives in this sphere of credit.

#### National Economic Development Bank (BNDE)

The National Economic Development Bank (BNDE), created in 1952, corresponded to a large extent to the official endorsement of the suggestions and priority projects drawn up by the Brazil-United States Joint Commission. It is the most important institution of basic industrial financing in Brazil and it played an extremely important role as a support to the process of industrialization.

From its foundation in 1952 until 1956, BNDE financed almost exclusively investments in infrastructures (power and transport). As of 1956, besides maintaining the financing of infrastructure, BNDE expanded its activities to the direct financing of the modern industrial sectors. Its supply of funds for manufacturing industry favoured steel-making and the chemical and automobile branches.

BNDE's main source of funds was originally the Fund for Economic Reequipment (FRE) made up of charges on income tax and of compulsory deposits of part of the technical reserves of insurance and capitalization companies. Besides these resources, the Bank also received deposits of money originating from the sale in the country of American agricultural surpluses provided under the so-called Wheat Agreement.

Besides granting loans after the analysis of projects was considered satisfactory, the Bank followed up the physical evolution of investments. In many cases it even controlled the operation of new units, conditioning the liberation of funds already approved to the fulfillment of certain requirements. It thus exercised the functions of controlling and orienting the expenses in the favoured sectors, besides that of being a centre of analysis of the government's sectoral programs.

Although BNDE is not an agency with a specifically regional action, it indirectly influences the special distribution of investments through the transfer of resources it makes to regional development banks and similar bodies through its several funds. This indirect influence reflects a strategy of action on the part of the Bank: BNDE's present

policy consists of decentralizing its activities through expansion of the transfers to regional and state development banks and private investment banks. This strategy led to the creation in 1972 of the Special Program of Loans to Development Banks (PEB), which was linked to the Fund for Economic Reequipment (FRE), and which would work basically through transfers to development banks; and more recently to the creation of the Special Program of Financial Support to the Basic Industry in the Northeast (PID/NE), now engaged in financing the setting up of the first phase of the Northeastern Petrochemical Pole. The results of this policy of decentralization have already made themselves felt in quantitative terms; although the country's southeastern region still receives the majority of resources available from the several funds and programs, its participation decreased in 1972.

At present, BNDE acts through several funds, the Scientific and Technological Development Fund having the most weight. The main objective of this Fund is the promotion and support of programs and projects aimed at the development and improvement of techniques, processes, and products. The Bank also operates through its agencies or subsidiaries, such as the following:

(a) Basic Inputs S.A. Financing and Participation (FIBASE): The aim of this agency is to achieve in the shortest possible term the production of the basic inputs needed for development within the country, especially in the sectors of fertilizers, non-ferrous metals, paper, and cellulose, as well as organic and inorganic chemical products. This financial institution is an operational mechanism of BNDE and an inductive and discretionary instrument.

(b) Brazilian Investment S.A.: This agency's aim is to orient investment toward the national private enterprises through the use of small (risk) capital.

(c) Special Agency for Industrial Financing (FINAME): This agency aims at financing the sale of capital goods through operations that enable them to compete in the international market.

In late 1971, FINAME's Long-Term Program was set up, operating with terms of up to 8 years and aimed at improving the commercialization of machines and equipment produced to order (which, in view of their larger size, greater technological sophistication, and longer time of making, need resources on a longer-term basis and with special conditions), and of sets of equipment produced for industrial units.

In October 1972, FINAME's Special Program was elaborated with the aim of creating competitive conditions of financing for national equipment through the extension of the term basis up to 15 years and an interest rate of 3% to 6% per year plus monetary correction. It was hoped that this would make feasible the import substitution of those capital goods being ordered in the foreign market for lack of adequate internal financing, as well as enable the incorporation of new technologies of production, within the framework of the general directives of industrial policy.

In this sense, although FINAME is not very important in quantitative terms, it is expected to represent a strategic element in the maintenance of industrial growth based on the growth of the production of capital goods, precisely on account of the qualitative importance it has taken in view of the Long-Term and Special Programs and of the great flexibility of its operations.

#### FINEP: Institution for the Financing of Projects and Studies

FINEP is a public enterprise acting as the executive secretariat to the National Fund for Scientific and Technological Development.

It aims at giving financial support to priority projects for scientific and technological development aimed at implementing the Basic Plan for the Scientific and Technological Development Plan, in accordance with the orientations given by the Ministry of Planning and General Coordination.

FINEP is a financial institution that implements the development plans of the government through the financing of studies and projects such as the following:

- feasibility studies of industries, agricultural activities, agro-industries, agriculture, and cattle;
- regional or sectoral projects of development;
- studies for the utilization of natural resources;
- technical assistance and economic consulting services;

- program of support to the national consulting firms, which may entail financial help for physical infrastructure, rotation of capital, and training of human resources;
- program for the development of industrial technology aimed at encouraging national industrial enterprises to create their own technology through the development of new products and processes, the investment in research and development centres, and the training of human resources.

The principal users of FINEP are institutions linked to the public sector that have improved their capabilities in the process of planning and make decisions on important projects.

The resources of the National Fund for Science and Technology Development administered by FINEP are oriented mainly to the modernization of the institutional infrastructure in science and technology for the formation of human resources for science and technology. The sectors most favoured by the Fund are first the educational and second the industrial.

There is no formal evaluation of FINEP, but its history proves it to be a dynamic institution that has accomplished its original functions and has become an important supporter of scientific and technological development. Together with the National Research Council, FINEP has participated in the elaboration of the Basic Plan for Scientific and Technological Development.

The resources of FINEP have come from external credits (USAID-BID), the Federal Union, and the results of its financial operations.

#### KOREA

The Korean government influences the operation of its financial system through the Central Bank (under the Bank of Korea Act), as most governments do throughout the world. In addition, the Ministry of Finance on behalf of the government acts as the dominant shareholder of most of the nationwide commercial banks and all of the special banks. Even with such control over the volume and direction of money supply and the channels through which savings flow toward investment, the government was unable to stabilize the private movements during the last decade. Because of persistent inflation, domestic savings were not expanding at a rate sufficient to finance the high rate of investment planned by the government under its Five-Year Development Plans.

A large part of investment in Korea were therefore financed by credits from foreign suppliers of capital goods. This resulted in a low demand for capital goods production technology in Korea.

Persistent inflation also suppressed the growth of long-term capital markets in spite of the wishes of the government. As a result, activities to supply new technology could not obtain long-term financing as needed, and the deficiency in financing was made even worse by the lenders' natural preference for real properties as collateral for loans in an inflationary environment. An effective control of inflation and an expansion of domestic long-term capital markets is needed to develop the necessary financial environment that can favour technological development.

During the last decade the Korean government financed between 12% and 26% of total investment in Korea. The Economic Planning Board administered the financial activities of the government through the budget. It also controlled foreign loans and investment, which financed between 15% and 44% of total investment.

The Ministry of Finance controls the financial institutions through which private savings are channeled to investors. Through the Monetary Board and the Central Bank (the Bank of Korea), which operate under the Bank of Korea Act and the General Banking Act, the Minister of Finance influences the operations of commercial banks, which include:

- five nationwide commercial banks
- ten local banks
- the Korea Trust Bank
- nine foreign bank branch offices.

In addition, the Ministry of Finance directly controls eight special banks, established by special legislation, which include:

- Korea Development Bank
- Korea Exchange Bank
- Medium Industry Bank
- Citizens National Bank
- Korea Housing Bank
- National Agricultural Cooperatives Federation
- Central Federation of Fisheries Cooperatives
- Export-Import Bank.

The total assets of all banking institutions were equivalent to 76% of the GNP in 1973. The commercial banks together held 48% of the total assets of banking institutions as of the end of 1973, while the special banks held 52%. At present the government owns more than one-third of the total shares of four out of five nationwide commercial banks and the Korea Trust Bank.

In addition to the regular banking institutions, the trust accounts of the Korea Trust Bank, life and nonlife insurance companies, short-term finance companies, mutual credit companies, and the Korea Stock Exchange are the important nonbanking financial intermediaries that are beginning to assume an increasing role in the financial system.

The bulk of trust funds placed at the Korea Trust Bank are in an account called "money-in-trust," which is almost identical to a bank deposit. The total assets of the trust department account for about 6% of the total assets of banking institutions. Life insurance is underwritten by six companies and nonlife insurance by 12 companies; their total assets as of the end of 1973 were equivalent to 3% of those banking institutions.

Short-term finance companies were institutionalized in 1972. They are expanding rapidly as discount houses of commercial bills. The mutual credit companies, also institutionalized in 1972, are small-scale businesses. Their total assets as of the end of 1973 were equivalent to only 1.4% of the assets of banking institutions. The Korea Stock Exchange operates under the Securities Transaction Law. The stock market is in the early stage of development with a market value of listed stocks equivalent to 11% of the total assets of banking institutions.

The Korean government has almost complete control over the financial system in Korea. In addition to the monetary policy instruments of the Central Bank, its ownership of most banking institutions puts total responsibility for controlling the volume and direction of money supply on the government. Since the beginning of the first Five-Year Development Plan in 1962, the financial system has been heavily used to channel savings into selected development projects.

Korea's rapid economic growth was accompanied by rapidly rising prices, especially in the early stages. In 1962-1966, because of persistent two-digit inflation during the last few decades, it is difficult to evaluate the profitability of a business with confidence and objectivity. Lenders, therefore, tend to require real properties as collateral for loans. Since creative entrepreneurs often do not own real properties, the lenders' preference for real properties as collateral restricts the financing of activities to develop new technologies. When they are restricted to self-financing, the pooling of resources for activities with economies of scale tends to become difficult, and activities to supply new technologies are likely to be neglected.

Heavy reliance on the foreign suppliers' credit reduces the demand for domestic capital goods production technology. For example, the expansion of capacity in steel, aluminium, and copper industries in Korea is partly financed by foreign suppliers' credit. Since these are industries that process imported raw materials with imported equipment, their employment and net foreign exchange earnings potentials are limited. They absorb a large share of domestic savings, however, as they require large-scale infrastructure investment for their exclusive use. Although their opportunity cost in terms of domestic investment resources is high, their contribution to national income and employment measured by their domestic value added, evaluated at international prices, is small.

If expansion of capacity in these industries is justified, it would be on the ground of learning new technologies. Since they are built under turnkey contracts, they do not normally contain many learning activities. These projects, therefore, must contain an independent program of technology learning to be economically justified.

The control of inflation is a prerequisite for the normal development of long-term capital markets and a higher rate of domestic savings. A widespread indexation has been used in Brazil, for example, as a helpful device in an effort to reduce the rate



of inflation while accelerating the rate of economic growth through a revival of long-term capital markets and an expansion of domestic savings. Such a development will satisfy the preconditions for the development of technologies in capital goods industries and the adequate financing of activities to supply new technologies.

## PERU

### Development Finance Corporation (COFIDE)

COFIDE was created in March 1971 as a state financing institution giving credit and financial support to all of the productive and service sectors. It therefore covers the public, private, and social property sectors of the Peruvian economy.

Because of its key position within the investment process, this instrument has a potential influence in determining the technological conditions in which those projects are carried out, basically through (a) the utilization of its negotiating capacity to obtain favourable technological conditions in projects with foreign financing in which COFIDE acts as fiduciary middleman, and (b) the selective granting of credit on the basis of technological criteria, and the imposition of conditions that lead toward greater internal technological development in the case of projects financed with COFIDE's resources.

The main function of COFIDE is to support both state and private entrepreneurial action, providing the necessary financial resources, developing the domestic stock market in a parallel manner, and securing and channeling domestic savings. COFIDE can perform the following functions:

- establish enterprises and acquire shares in them;
- manage the shares of given enterprises;
- coordinate and regulate the issuing of stocks, bonds, certificates, and other documents of enterprises in the public sector;
- act as middleman or trustee in the stock market;
- acquire and maintain bonds, certificates, and other documents in portfolio;
- negotiate credits;
- grant medium- and long-term credits, preferably through financial middlemen;
- issue and float stocks, bonds, and other types of securities in the country and abroad.

At present, COFIDE is the primary national financial body and its activity is directed principally toward supporting the entrepreneurial function of the state, coordinating with the state enterprises, and financing their main development projects.

In this way the loans have been oriented toward the sectors where the state has placed major emphasis: mining, hydrocarbons, energy, and industry. Through its financial activity it has helped link the national economy more intensely and effectively to the international financial system and the world market.

But, on the other hand, COFIDE has not utilized its negotiating capacity to impose favourable technological conditions. More importance was given to factors (for the selection of external credits) such as the conditions under which credits are granted, that is, interest, periods for amortization, etc.

Furthermore, in the selection of projects financed with its own resources, criteria such as profitability, capital recovery period, etc. have predominated over technological or social criteria; it has thus behaved like any private bank.

### Industrial Development Bank

The Industrial Development Bank was created in 1936. In 1971, with the re-organization of the financial system and the creation of COFIDE, it ceased to be functionally subordinate to the Ministry of Industry and passed into the administrative area of the Ministry of the Economy and Finance, together with the other state development banks.

Its action is directed toward giving financial support to the industrial, fishing, and electricity sectors, and also priority services to small industries and handicrafts.

In addition to the criteria employed in granting credits, the Industrial Bank is able to purchase and build experimental pilot plants and manage them directly or through a contract with a specialized enterprise. It finances research studies and grants study, research, and training fellowships.

The objectives of the Industrial Bank are to promote and support industrial activities, the production of electricity, and the development of the fishing industry and national handicrafts, according to the priorities established by the General Development Plan.

The credits granted by the Industrial Bank have been oriented toward the most dynamic branches of the economy. Those credits are adapted to the nature of the demand and the evolution of the market and do not favour any particular orientation. The loans granted to consumer goods firms accounted for 28.7% of the total loans in 1973 and 46% in 1975, paralleling the nature of the relative expansion of the domestic market.

Loans to the enterprises classified as producers of capital goods fell during the same period from 46.2% of the total loans in 1973 to 26.1% in 1975, with a noteworthy decrease in the production of transportation materials, and especially fishing vessels, which accounted for 90% of the total loans for capital goods.

The Industrial Bank has practically restricted itself to furnishing resources at a lower rate of interest than the commercial banks, without establishing any policy orientation or any considerations of technological policy.

#### Mining Development Bank of Peru

The Mining Development Bank initiated its activities in 1941 as a financial body linked exclusively to the mining sector. Through Decree Law 18,303 of September 1970, it was reorganized and defined as a decentralized public organism incorporated within the economy and finance sector. Its specific function is to give credit, financial, and technical assistance services to the mining sector. For this purpose, it functions with economic and administrative autonomy, though subordinated to the financial policy guidelines laid down by the Ministry of Economy and Finance.

Parallel to its function of giving credit and evaluating the projects it finances, the Bank gives technical assistance services, principally to small and medium-sized mining firms, develops projects, designs and sets up processing plants, develops new mining zones, disseminates new systems for prospecting, producing, and processing, and markets inputs and machinery for mining activities.

In the last 5 years the state's main emphasis in the mining sector has been on the development of large projects with modern technology and large capital investments to enable this sector to fulfill the role that is explicitly assigned to it in the Development Plan as the principal national supplier of foreign exchange. Under these circumstances the rapid implementation of the projects and high income return have taken precedence, as criteria, over the production of domestic technological development and a technical infrastructure parallel to the demand generated precisely by those projects.

Within this context small and medium-sized mining firms, which are exactly the firms that the Mining Development Bank should give its support to, have assumed a secondary role. In the face of the crisis in this sector, due to the instability of world prices and the rises in input costs, the action of the Mining Bank has been basically limited to lessening the negative effects of those factors upon private mining.

#### ARGENTINA

##### Permanent National Fund for Preinvestment Studies

Law 17,584 established a fund for the partial financing of different technical studies and analyses related to the identification and evaluation of investment projects, both at the private and the public level. The type of studies covered by this fund are those related to research in general, the development of natural resources, and sectoral studies capable of identifying specific programs; also included are studies of piecemeal engineering and the task of formulating the basis for public bidding. One of the aims of the Law is to develop a permanent and interdisciplinary group of consultants of a highly professional level.

When this Law was recommended for approval, it was stated that the above-mentioned

tasks, because of their technical complexity and specialization, should be entrusted to groups or teams of expert consultants. Considering that there exist in the country several groups of specialized consultants integrated with Argentinian professionals, it is also in the national interest to maintain and increase both the technological level and the occupational level of these teams. Nevertheless, this fund has had little success in accomplishing its main objectives, mainly because of the limited administrative capacity attached to it, which led to a passive attitude toward possible users.

#### STATE PURCHASING POWER

Next to industrial programing and financing, the use of state purchasing power can be considered among the instruments with a powerful role to play in defining the pattern of demand for technology. In most of the countries studied the state budgets represent a very large proportion of the total consumption and of total investments, and in many STPI countries the state has become a direct producer by the intermediary of large firms, in particular in the basic industries sector.

It is therefore evident that the government's conscious policies can introduce a given type of behaviour in state enterprises and departments that favours the development of indigenous scientific, technological, and engineering capabilities. When purchasing goods or services, state firms or departments (ministries, autonomous government institutions, etc.) can demand not only greater participation of national technological and material inputs but also constant qualitative improvements in the goods or services domestically supplied to or by them. This implies that the state firms or departments must be willing in some cases to incur possible additional costs, tolerate possible delays, as well as venture into possible lower qualitative results, taking all these as necessary risks involved in the learning process and as consequences of the dependent character of the country. Without making virtue of necessity, it can nevertheless be said that such flexibility is not always possible and is very seldom present. The following cases are examined in this section:

- Venezuela - Technological behaviour of state firms in basic industries.
- Purchasing policies of the state.
- Brazil - State enterprises as policy instruments.
- Argentina - Buy domestic law.
- Peru - State investment policies.
- State enterprises as technology policy instruments.

The evidence found in the STPI studies shows that the purchasing power of the state has acted only as an indirect policy instrument in scientific and technological development. Its effects are not always positive. The case of Venezuela where the criterion of urgency is predominant over any other has created serious setbacks and brought about negative consequences on the internal engineering efforts of state firms aimed at a greater assimilation of technology. The possible benefits of the purchasing power of the state are not, therefore, an automatic result of its sheer size.

#### VENEZUELA

State enterprises represent one of the most important instruments of technological policy according to the limited experience of some Latin American countries and the far wider experience of advanced nations. In the latter, it is very difficult to imagine the development of key sectors involving advanced technology without the existence of a clear and determined policy on the part of these firms.

In Venezuela the situation has been completely different. State management has had very different interests and goals and more than anything has been characterized by a tendency toward straightforward importation due to a lack of interest in generating, adapting, and improving productive technologies, and moreover a lack of interest in optimizing the conditions in which foreign technology is acquired. This, in turn, is related to the overwhelming interest of the state to modernize and expand industry as fast as possible and by the shortest route available.

This section deals with the state firms in terms of their current and future significance as tools for technological development. Account is taken of the fact that, according to the Fifth National Plan, these firms will have a decisive role in national economic development and will be almost as important in the creation of a national

technological capacity.

Since oil was discovered the development of the Venezuelan economy has depended fundamentally on the state. From that time until 1973, public expenditure was always more than a quarter of the national income. In addition, more than half the fiscal revenue has come from the oil wealth and nearly 40% of fixed investment is of public origin. However, despite this, the direct participation of the state in production has been small.

In the economic sphere the state has acted as a dispenser of credits, exonerations, subsidies, etc., for private capital. It has also provided an adequate physical infrastructure for private capital to act (i.e., irrigation systems, roads, etc.). As an entrepreneur its activity has been limited and has always responded in one way or another to the idea of public service. The state has entered into productive activities in sectors that are not attractive for private capital, either because of the risks involved or because of low profits. Often it has subsidized private investors by means of low prices; the state steelworks and petrochemical industry are very clear examples of this.

Since 1974, however, there has been a change in the economic function of the Venezuelan state, as a result of the so-called New Development Model adopted. The key elements in this are the basic industries orientated toward exportation. The justification for the adoption of the New Development Model is found in various factors. First, the new pattern of the international division of labour has begun to give rise, for various reasons, to a displacement of certain industries from advanced to developing countries. This is occurring, for instance, in certain of the so-called heavy industries. Second, there are already visible signs that the process of import substitution is becoming exhausted. National industry is unable to compete with foreign industry and therefore cannot contribute in a significant manner to the fulfillment of the new strategy. Finally, conditions exist for the formation and development of these basic firms: natural resources, physical location, a relatively good financial situation as a result of the rise in oil prices, etc.

The Fifth National Plan states that in principle the development of the basic industries is the responsibility of state firms. However, it goes on to establish fairly wide exceptions. Thus in the case of the steel industry, the Plan states that private capital will not participate in the basic process industry except "when technical or economic reasons justify it." It also indicates that in processes other than basic ones, unrestricted participation is permitted. As regards the petrochemical industry, joint ventures for basic products are prohibited except when necessary, but they are permitted for by-products, providing the state holds 51% of the investment, and for complementary products without the majority participation of the state.

The New Development Model presupposes modification in the rationality that orients the behaviour of the state firms. They can no longer operate ambivalently, that is with private enterprise criteria as firms, but must operate with public criteria as state entities. By becoming the defining elements of the new strategy, the state firms clearly have to be concerned above all with profits, and it is only in these terms that they may be evaluated.

#### The Technological Behaviour of the State Firms in Basic Industry

The most striking fact, as was pointed out earlier, is that the state firms have little or no concern for the technological aspects of development. This was true when they had a limited role, almost only as a support for private capital, and is still true although their objectives have changed and their role is more important. They have behaved as if technology were a fixed and external fact whose characteristics and conditions of acquisition are imposed by the foreign supplier. Their behaviour has been clearly dominated by a perspective that only takes into account the immediate situation. The preeminence of economic considerations, or more correctly, of the objectives of production, has pushed aside any other sort of concerns. The stimulation of national technological potential has been sacrificed for the security that established goals will be fulfilled on time. The risks inherent in the participation of Venezuelan research workers or engineers in the design and installation of industrial plants, contrasted with the confidence inspired by the technological package brought from abroad, has become the principal brake on the development of a local technological capacity. Thus the guiding thread in negotiations about the purchase of technology is constituted by the weighing up of these risks, not only for the user, but also for the supplier. The latter weighs

them up in the same way as the former: he fears local participation for two reasons - first, he wishes to protect his image of being efficient, and second, exporting packages means better profits associated with the ascendancy over the buyer.

This approach, short term and concerned primarily with the economics of the situation, has justified the technological passivity of the basic firms. The contracting of turnkey plants in which the technology is acquired quickly and safely closes the door to the possibility of local learning. The first negative effect is that it prevents the assimilation of technology through experience by national managers, research workers, engineers, and technicians. In other words, it blocks off a source of external technological economies, which are of undoubted importance for the industrial process of the country.

The disaggregation of the technological package, decisive in a strategy based on learning by doing, produces benefits that almost certainly will not be capitalized by the plant owner who imports the technology in the first place, but will be external to his project. In the case of a private firm, it can easily be understood that the incentives offered by disaggregation might be minimal, since they might even benefit competitors. The situation should be different, however, in a state firm, where the external economies generated in this way should be seen in the long term from a social point of view (9).

The criterion of social effects has not and does not govern the behaviour of the state firms. The development of technological capacity has always been seen as a goal that, to be achieved, implies sacrificing the achievement of the fundamental objectives of the firm. When the aim was that the state should dispense a good, cheap, and prompt service, anything that might act against the quality, price, and convenience of the service in question was pushed aside. In the present situation, within the New Development Model, the goals are quantitatively and qualitatively different. In view of the imminent end of the process of substitution, the basic firms represent the key to capital accumulation in an economy that has to structure itself and grow by means of exports and, on the other hand, that should fulfill its role efficiently in the international division of labour. Given these goals it seems there is not much room for a consciously developed learning process. Technological learning is covering only the requirements for the use, maintenance, and optimization of equipment.

The Venezuelan STPI team maintained that the function assigned to the state firms within the national economy has largely determined their technological behaviour. The latter has always been subordinated to economic policy as a result of the dilemma between production goals and technological goals. This dilemma is sustained by the firm opinion that the acquisition of technology in packages assures the adequate achievement of the established production goals by passing all the responsibility to the foreign supplier. To put it the other way around, the dilemma originates in the idea that to the extent that local technical participation in the various phases of an industrial project is allowed, to the same extent are quality and efficiency endangered, and consequently the economic growth of the firm is also endangered.

There are four points to make regarding the previous paragraph. The first is somewhat obvious: even when it is disguised as economic urgency, this attitude openly and passively accepts that in the international division of labour it is the task of some to produce knowledge and of others to make use of it. This acceptance leads axiomatically to the corroboration of the domination exercised by advanced nations by means of technology.

On the other hand, turnkey contracts have entailed problems that cannot be ignored or minimized, e.g., delays, flaws, excessive costs, etc. The path followed by Venezuelan state firms in the basic sector is instructive in this respect and shows that purchasing in packages also implies risks that are probably directly related to the absence of the buyer in the formulation and implementation of the project. This appears to demonstrate that local learning is also necessary for immediate growth.

Third, it is not true that the choice between economic and technological goals can be dealt with without looking further than the short term. To be valid, the dilemma would have to take into account the external diseconomies produced by the importation of packages in terms of the future global development of the country.

The fourth and final comment follows from the previous ones and leads to the view that the dilemma is really a false one. In effect, a dilemma between economic and technological policy can only be maintained if it is believed that the latter's goal is the

immediate and total replacement of foreign technology. This is not the case if the technological goal is understood as the progressive incorporation of national capacity in accordance with the development of local abilities and contained in a long-term strategy that does not distinguish between the economic and the technological, since present technological decisions have future economic repercussions. There is no dilemma then. The problem is not that if economic growth is desired, then local technological growth should be sidestepped, and if technological growth is desired, then economic growth will be threatened. Both goals should be dealt with within a general long-term policy.

#### Purchasing Policies of the State

In the previous section the relative importance of the Venezuelan state within the national economy was mentioned. It is therefore unnecessary to go into this question any further. By its sheer purchasing power - among other factors - the Venezuelan state plans a decisive role in the development of the country.

In Venezuela, this capacity has not been used as an instrument for promoting the demand for local scientific and technological services. The state's purchasing policy has never had as its explicit aim the direct acquisition of R&D services, whether for the production of new technologies or for the modification or adaptation of existing technologies; nor has it been used for the acquisition of the engineering and consulting services necessary for the formulation and implementation of industrial projects; nor, finally, for the acquisition - under special conditions - of goods incorporating local technological services.

The Buy Venezuelan Decree, promulgated when industrialization was just in its very beginnings and - until recently - not substantially modified, clearly reveals the purchasing policies of the state. This Decree, as its preamble states, takes into consideration that "a large share of national consumption is channeled through the Public sector, therefore it is necessary to adopt certain measures to direct the purchase of this sector towards the internal market so as to stimulate national production." The first article reads therefore: "the organisms of the Central Public Administration, the Autonomous Institutes, the State Enterprises and other agencies of the Decentralized Administration will not purchase imported commodities when they are available from a national supplier, in the terms contemplated in the present law."

In general terms, this Decree could be a positive instrument for directing the internal demand toward local scientific and technological resources. In fact, however, it has only been a statement of good intentions, mainly for three fundamental reasons:

(1) There are no mechanisms for its application. The Decree is weakened by its vagueness, which transforms its effective content into just a general framework for the behaviour of the state.

(2) The public sector has not developed any policies that could result in concrete hopes for the potential local supplier. It does not have, for instance, a definite and publicized medium- or long-term purchasing plan, nor has it standardized the purchase of batch products.

(3) There is a definite tendency toward importation, as a result of two inter-related phenomena: the local technological weakness, and the security that comes with the goods and services contracted abroad. The preeminence of established economic goals leads to the purchase abroad of the technology and capital goods required, in the stipulated time and form. This means that the internal supply of technological services or machinery and equipment implies "risks that should not be incurred."

Besides, it is worth pointing out that by its very wording this Decree tends to become ineffective. Article 4, for instance, includes a caveat that reads: "(this article) will not be enforced if the purchase of goods produced abroad is in the opinion of the Minister or the highest authority, urgently needed."

The Decree becomes a discretionary instrument given such a norm. In effect, imports of goods and services have not been curbed because they can easily be qualified as "urgently needed."

Furthermore, Article 2 indicates that for this Decree "the price of the nationally-produced goods cannot be higher than the similar imported products or substitutes."

Even if it is too early to evaluate the repercussions of this Decree, it is fair to ask if it will not end up favouring foreign goods and services, because the national supplies, being new, are not in a condition to compete with supplies imported from the industrialized nations.

## BRAZIL

### State Enterprises as Policy Instruments

State enterprises are probably the most direct form of intervention whereby the state directly intervenes in the production of goods and services, replacing the private entrepreneur. State enterprises in Brazil control most of the intermediate goods sectors (steel, oil, petrochemicals, power generation, telecommunications, railways, iron mining, etc.). This is indicative of the limitations of the possibilities for a full-fledged industrial development based on private enterprises in a dependent and peripheral country.

It seems a valid assumption that the conditions and interests governing the creation of the state enterprises would very much define their policies as regards the use of national or foreign sources of technology.

State enterprises in Brazil, as in other countries, have an ambivalent behaviour: an entrepreneurial behaviour concerned with profits and capital accumulation, and a governmental behaviour that implies that the policy of the enterprise will very much respond to the interests of the ruling political group.

State enterprises in Brazil, as in other countries, tend to concentrate in the capital goods producing sectors; that is, they are the suppliers of goods and services that constitute essential inputs to the production of the other units of the economic system, which generally are privately owned. This is one of the most widespread forms of channeling state subsidies to private industry.

The Brazilian study suggested that the strategy adopted for the development of a state enterprise, and accordingly the criteria for choosing technologies, have very much to do with its financing pattern. Some of the state enterprises are dependent on foreign resources that are provided by foreign banks or international development agencies.

The criteria applied by national banking institutions, such as the National Development Bank, are usually conservative, demanding thorough analysis of the profitability of the project and the capacity for repayment of the loan. This short-term view based on private profit considerations may considerably limit the autonomy and the potential of state enterprises.

Therefore, it is suggested that when enterprises base their expansion programs on foreign loans or on conservative banking institutions, such as the National Development Bank, foreign suppliers and their domestic branches tend to be preferred instead of national suppliers, either on account of scale of operations or experience, or because national suppliers cannot match the prices of the foreign suppliers.

The internal availability of public resources for financing the expansion projects of state enterprises is fundamental for the use of the potentialities of state enterprises, but it is not enough.

The state enterprise that has to finance itself on the basis of its own profits will usually try to increase its profitability through an increase in productivity, because it is forbidden to make profits from higher prices. This would probably lead the firm to give more attention to technical and engineering problems, and then to research and development activities. This attention could lead the state firm to improve technological decisions.

It is therefore possible to establish a correlation between the technological development effort of an enterprise and its financing pattern. Given the conditions of the national industry of capital goods and of engineering firms in the country, the domestic technological development effort should rely on the initiative of the state enterprises themselves.

Planning is of fundamental importance for a greater use of appropriate national technology. The decision about what can effectively be produced internally and what must be imported requires a minimum delay in preparation and mutual consultation necessary to

increase the national industry's share in technological supply, furthering its development.

Given the conditions of lack of capacity for planning in the national industry of capital goods and the almost complete lack of engineering enterprises with know-how in basic engineering design, it seems that the state enterprise will have to be, at least in the beginning, the starting point for the development of this kind of knowledge in the country.

It is clear that, although the participation of the financial costs of engineering services may often be very small in the total cost of an investment project, the activity of consulting engineering has great economic importance both in defining the several stages of an investment project and in its future development.

The largest consumers of consulting engineering services are the state enterprises. The development of the national structure of engineering should therefore be based primarily upon those enterprises' investment policies and effective support. This predominance of the state enterprises as consumers indicates that the decisions about the engineering services they contract should not be left to the exclusive criteria of their administrators.

The Brazilian STPI team tried to understand the forms of connection that are established between the state enterprises operating in the steelmaking, hydroelectric, and petrochemical sectors and the enterprises of consulting engineering, whether they be local (national ones and foreign subsidiaries) or foreign. To do so, the team identified the spheres of action of both local and foreign enterprises of consulting engineering, by means of the technological characterization of the sectors under consideration.

It was also intended to analyze the most typical forms of relationship between state enterprises and project firms. With that end in mind, the team stressed the process of selection of the project firms, the surveillance of the engineering services by the state enterprises, the kinds of association between national project firms and foreign engineering, and the nature of the contracts of consulting engineering services.

Nevertheless, to understand the relationship between state enterprises and project firms, the aspects mentioned above had to be complemented by a study of the main problems national project firms were facing. These problems have been hampering the achievement of greater efficiency in the process of absorption of technology and in the organization and administration of the projects developed by these enterprises.

Generally, it can be said that the solution of several of the difficulties faced by national and local consulting enterprises depends to a large extent upon the procedures adopted by the state enterprises.

Following this line of reasoning, the following items were especially stressed as external factors exerting an influence upon the consulting firms:

- the lack of better planning in the contracting of services by the state enterprises;
- the requirement of previous experience;
- the lack of general norms regulating the contracting of services;
- the diversification of the procedures of the various state enterprises concerning the systems of recording data about consulting firms, the rules for submitting proposals, etc.

It seems that the knowledge gathered by the state enterprises can be transferred more easily to the national engineering firms - with better commercial and contractual conditions - than that gathered and transferred by foreign engineering firms. Therefore, process engineering in the state enterprise would not act as a competitor against the national private sector, but would work side by side with it, strengthening it.

This being so, the participation of the state enterprises in the basic process design in certain sectors would lead to a redefinition of the tasks of engineering between national and foreign enterprises, so that local engineering firms could be called upon to participate in more qualified tasks in the supply of engineering services. Such an action on the part of the state enterprises would also induce a greater participation of the national capital goods industries in the country's industrial activities.



## ARGENTINA

### Buy Domestic Law

The Buy Domestic Law is aimed at using the state's purchasing power by directing it to the domestic supply of goods and services, thus favouring both domestic industry and domestic engineering and consulting. This is clearly stipulated in the Law, which speaks about favouring "the industrial and construction sector as well as engineering and consulting services."

The Law assigns engineering and consulting services a special importance. It explicitly states that due to "the density of its intangible capital brought about by training, knowledge, experience and the decision and organization capacity of its professionals and experts...this type of capital cannot be transferred instantaneously but rather must be domestically created and requires long years of cumulative efforts on the part of society."

There are two specific aspects of the Law that should be especially mentioned, given the effects they had on the development of domestic engineering:

(1) It is mandatory for foreign consultants to associate with domestic firms to be able to participate in tenders. This is leading to temporary joint ventures with different implications and consequences: "in case an international tender is called for, no condition which explicitly or implicitly could discriminate against domestic enterprises, may be included. Furthermore, the foreign firms participating must associate with domestic enterprises..." (Article 8).

(2) Engineering and construction are differentiated; if effectively enforced, this differentiation would make possible the domestic development of true engineering firms independent of construction firms: "Domestic professionals as well as the domestic engineering and consulting firms included within the present law must be absolutely independent of equipment suppliers or manufacturers, contractors for public works or financial agencies which may compromise the objectivity of their judgement" (Article 15).

This instrument and the one that preceded it, the Buy Argentinian Law, are the first formal attempts to use the state's purchasing power to promote industrial development as well as to develop domestic consulting capabilities.

After a period of resistance, especially on the part of the officials charged with its application in state enterprises and agencies, the Law started operating as an efficient means of directing the state purchasing power to domestic industry, leading in some cases to the establishment of a special department for the purpose of developing domestic supplies.

On the other hand, there is no evidence that the Law has yet been a major factor in the development of technology creation or absorption capacity on the part of domestic enterprises supplying goods to the state. There are in fact no instruments concomitant with the Buy Domestic Law's action, promoting the technological development of state suppliers. To this must be added the limited investment planning capacity, particularly from the technological point of view, shown by most state enterprises. In this field the time factor is essential, and without adequate forecasting of state requirements it cannot be expected that private entrepreneurs will undertake the necessary investments.

In the final analysis, the technological success of the Buy Domestic Law depends on the technological capacity of the state enterprises themselves.

## PERU

### Public Gross Fixed Investment in 1968-1975

Table 4 gives a breakdown of the national gross fixed investment according to the public and private sectors. It shows how important the state is as an economic agency, above all on account of its investment activities. However, in trying to generate the means of production necessary for the productive structure, the state has, in fact, increased the need for foreign resources and has not utilized the country's own financial resources.

This effort has distorted the economy as well as, among other things, reducing supply and inflating demand, but the worst problem is that public investment, far from

substantially changing the productive structure, has in fact increased its dependence on foreign resources, both financial and technological.

Public Gross Fixed Investment by Sectors: Table 4 gives the percentage breakdown of public gross investment by sectors for 1968-1975. The importance of the following sectors can be observed:

(a) Oil plus mining are the sectors "earning and saving foreign exchange."

(b) Agriculture was the second most important investment area between 1973 and 1975. However, in 1974, 88% of the total cost of the projects corresponded to four large projects, Chira-Piura, Tinajones, Majes, and Olmos. Therefore, it is the coastal agriculture, which is basically agriculture for export, that received almost all the state aid.

(c) Infrastructure: transportation, communications, and electric power are also important areas of public investment. Like agriculture, most of the investment is in the coastal areas, although considerable efforts were made, especially in 1977, to build access roads in the jungle areas. However, it should be questioned whether these efforts are in the interests of oil exploitation rather than the result of a wish to develop the jungle, although it cannot be denied that the state has been trying to integrate the jungle for many years now.

Therefore, it can be said that the emphasis has been placed on sectors earning and saving foreign exchange, and on the infrastructure to serve these sectors. Furthermore, the state does not only invest itself, but it also promotes other investments. The state is the great promoter of foreign investment in oil and mining, and its efforts to develop these sectors are far greater than the figures for the public gross fixed investment suggest.

On the other hand, although agriculture for the domestic market and industry appears to be important in the plans, they only receive 10% of the gross fixed investment, despite accounting for 40% of the Gross National Product.

It appears that, despite all its good intentions, during 1968-1975 the Peruvian government was not able to make the agricultural sector more dynamic, although it has undoubtedly changed the production relationships. Nor has it transformed the industrial sector by freeing it from its characteristics of a dependent and parasitic sector, with a bottleneck in the external sector, which is so characteristic of all import substitution processes. The investment pattern has not changed and is still oriented toward exports. In this aspect the country's domestic policy is a reflection of world economic trends. New investments are constantly being sought for the available capital, which is always ready to help exploit raw materials and oil, which are always profitable, but, excluding the customary activities of the large corporations' affiliates, is more wary of taking risks in the industrial sector.

This phenomenon, which is partly a result of the small size of the domestic market, could be modified by the emergence of the Andean Pact expanded market. For example, there is a trend toward setting up mixed companies like those started by INDUPERU (Andean Tractors, Andean Motors, Machines, Tools, etc.).

The huge infrastructure projects have attracted foreign capital too, although in this area most of it is from the socialist block countries.

Technological Consequences of the Public Investment Pattern During 1968-1975: Public fixed investment has behaved like gross fixed investment as a whole and has tended to concentrate technology in the exporting sectors: oil, large-scale mining, agriculture for export, and infrastructure.

However, the other sectors, agriculture for domestic consumption, industry, and small-scale mining, which would make the economy more dynamic, capitalize relatively much less, despite the fact that the state's efforts in the industrial sector tend to be based on capital-intensive technology. An analysis of the relationship between gross production value (GPV) and employment, which was done for public investment projects planned or already implemented at the beginning of 1977, shows that the public sector was attempting to develop capital-intensive projects.

In 1973 the GPV/employment ratio was 0.739 for the industrial sector and 1.109 for public investment projects as a whole, broken down as indicated in Table 5.

One fundamental technological aspect of public investment is the technological training it generates and the consequent development of local technological capacity. Although technological training is very important when examining a country's technological capacity, it has been little studied and there are few tools for measuring it. For example, it is very important to know whether a particular foreign investment generates technological training and, consequently, an increase in technological capabilities in the country. The same should be known about the training generated by the activities of national, state, and private sectors that use foreign technology, and above all by plants running on a turnkey method.

The impact of public investment in Peru, in this respect, is very clear. MINEROPERU and INDUPERU in the mining and industrial sectors, together with PETROPERU in the oil sector, are the state corporations in charge of performing studies, carrying out investments, and establishing other state firms involved in productive activities. These corporations have developed a certain capacity to carry out preinvestment studies and select technologies. However, as they must guarantee profits, they have usually chosen advanced technologies, all of which have been developed abroad. For example, Stage I of the Cerro Verde Mining Project was exploited by MINEROPERU using imported technology and techniques, although there were alternative technologies developed in Peru. Furthermore, Stage II of the Cerro Verde Project has been carried out with the turnkey method, using foreign technology.

Although the Andean Pact's policy is to "disaggregate the technological package," the trend has increasingly been for state corporations to use technology under licence, and even to contact foreign firms during the preinvestment stage, instead of administering it themselves. Frequently, they prefer to use foreign licences when it would have been possible to negotiate and select the technologies more freely and use local technological inputs - they prefer to hand the projects over to companies that manage them on a turnkey basis.

For example, although PETROPERU has its own technical and engineering capacity in the area of refining, it has followed the trend of delegating projects as turnkey, which increases the projects' cost by 20% to 40%.

MINEROPERU has incorporated this trend explicitly into its concept of "integrated financing". The idea behind this is that foreign indebtedness is not in itself a problem, although it should obviously be rationalized at a macro level. According to this philosophy, it does not matter if foreign loans are obtained to finance a project if this project will earn more foreign exchange than that needed to service the debt. The idea of integrated financing means that the foreign partner is in charge of choosing the technology and of the total development of the project, so that it is impossible to desegregate the technology and to provide significant technological inputs from local sources.

Project costs have been rising continually on account of the worldwide economic crisis and the inflationary trends since 1973. For example, the cost of the oil pipeline was calculated at \$700 million but ended up costing \$1.069 million, so additional loans had to be found. Obtaining financing and purchasing equipment and inputs involves negotiations; supply problems and inflated costs become very difficult management problems for the state to deal with, especially when public finances and the balance of payments have been affected by the crisis. All this is aggravated by the critical situation of the public enterprises, which are deficit ridden, require state subsidies, and must be supported because they provide basic inputs for a very weak economy and industry.

The financing and management capabilities of state, mining, and industrial companies, including PETROPERU, are not developed to the point of being able to cope with this situation. For this reason, they find it easier that the foreign partner manages their large investment projects.

INDUPERU will contract a foreign firm, which still has to be chosen, to do the feasibility study for an integrated petrochemical project it is in charge of. The first stage of the project consists of a feasibility study, choosing technologies, studying the financing sources, and basic engineering.

In accordance with its concept of integrated financing, MINEROPERU has signed an agreement with INI (Instituto Nacional de Industrias) from Spain to exploit one of the most important phosphate mines in all of Latin America. After doing a feasibility study, INI could choose to exploit the mines itself through a joint venture with the state,

where it would have 49% of the shares. Possibly, in a joint-venture firm the state could exert some control over foreign interests and also protect its own interests, but in any case, the technology and negotiations will be controlled by the foreign firm, especially when its financing and management capabilities are greater than those of the state, which seems to be the case here.

Thus, faced with the economic crisis existing since 1974, and with the need for their investments to be profitable, public corporations and the state in general have decided to abandon the principle of "controlling and negotiating the technological packet" and hand the technological negotiations over to their foreign partners. They obviously want to make sure that estimates, costs, and timetables are kept, even though the project will be more expensive, and not run the risks involved in supplying inputs, searching for additional financing, and dealing with the technical problems that may emerge and that may threaten to delay the completion date.

#### The Development Finance Corporation (COFIDE) and its Technological Consequences

A study by F. Sagasti (10) on the possible use of industrial financing as an instrument of technology policy examines the role played by the Industrial Development Bank during the 1960s with its loans, and the leverage they gave the Bank. The study concludes that this leverage was not used to direct the loans toward an integrated development of industry and even less to promote the development of a local technological capability. At the end of the study Sagasti suggests that, given that COFIDE has been playing an increasingly important role in industrial financing since the beginning of the 1970s and has replaced the Industrial Bank to a large extent, the comments made about the Bank may be applied to COFIDE too.

In the study, Sagasti suggests some measures a financial entity like COFIDE could adopt to promote and encourage technological development.

First, as COFIDE basically grants credits for fixed assets as opposed to working capital or to finance repayments, it could control the percentage of machinery imported and insist that a detailed study be done on whether part of the equipment could be supplied locally. At present, COFIDE does not exercise this type of control.

Neither, for example, are the loans granted subject to the elimination of clauses restricting exports or to the stopping of over- and under-invoicing when the firm operates under a foreign licence. A minimum level of expenditures on research and development to promote local technological capacity is not a precondition either. Nor does COFIDE grant the loan on the condition that a study of the possible contribution of the local technological infrastructure is made.

In fact, COFIDE does no technological evaluation of the projects it finances and the limited attempts to do this have come to nothing. First, COFIDE does not have an infrastructure capable of doing such an evaluation, and second, it has never received enough requests to justify a selection of projects and the granting of selective credit on the basis of technological considerations.

Furthermore, if COFIDE were to set these kinds of conditions, it would clash with the state organizations whose functions are supposed to be the evaluation of technology and who have the necessary infrastructure to do it. COFIDE's evaluation is mainly economic and financial, like that of the other state organizations and the public sector in general, which are pressured by the need for profitability. In reality, COFIDE and the state corporations seem to cooperate on this point. There are many cases where the companies bring their own financing and technology and COFIDE only guarantees the loan.

#### State-Owned Companies as Technology Policy Instruments: The Example of the Cement and Paper Industries

This section discusses some aspects of the cement and paper industries, which are owned by the state. An attempt will be made to draw some generalizations that could be used as guidelines for assessing the importance of state enterprises as technology policy instruments (TPI), and the possible way in which they could influence the development of technological capabilities.

There are usually two alternatives for supplying the technology needed in the investment process: the technology is either produced or bought. Thus, to examine the character of the state-owned companies as technology policy instruments, it is necessary to ask:

- What technology do the state-owned companies produce?
- What technology do the state-owned companies buy?
- What technology do the state-owned companies consume?

Each of these aspects will be examined in turn.

The Production of Technology by State-Owned Cement and Paper Enterprises: In Peru the state has a monopoly over the cement industry and paper pulp preparation. However, the nationalization process is not completely finished, for it is a very recent phenomenon and one that is not yet very well defined. Therefore, it is necessary only to examine these firms' activities since 1974 to get their complete history as state-owned enterprises. From the perspective of the generation of technology, the figures showing the participation of these enterprises in the technology research projects organized and promoted by the Industrial Technology Institute (ITINTEC) will be presented.

ITINTEC (11) has stated that since it took over the functions of evaluating, authorizing, and supervising company research projects financed with the 2% of the net income of industrial firms, it authorized a total of 213 projects for a total of S/325 million up to April 1976. For administrative reasons the projects were only authorized in 1971 (60 for a total of S/63 million), 1974 (89 for a total of S/142 million), and 1975 (64 for a total of S/120 million). The report says, "It should be emphasized that in 1974 projects to be financed using the 2% of the Net Income collected since 1971 were presented." Whereas few projects were evaluated during 1972 and 1973, a large number of projects were approved in 1974. Therefore, it is more interesting to analyze 1974, even more so if it is remembered that the 1975 figures are still provisional.

Table 6 shows that in 1975 the state-owned companies corresponding to the industrial sector were responsible for 24.6% of the allocation for research projects, and the paper and cement industries were together responsible for 20.5%. The paper industry had the larger part of this (15.9%) and the remainder (4.6%) was in the cement industry.

Thus, in 1975 these industries were very dynamic in technological research. This dynamism was most marked in those companies that had previously belonged to the Grace Group, and when they were under private ownership, the same had been true.

The same trend exists in the cement industry. It is not the Empresa Publica Cementos Yura that promotes technological research among the cement industries, but the companies that were privately owned until recently: Cementos Lima and Cemento Andino. Moreover, the majority of the investment in research done today by the state-owned companies as a whole is done by the companies that were originally created with private capital. These firms stimulated the technical development of their personnel and offered them the possibility of training to learn and master the technological skills needed in these production areas. This was done in conjunction with the national university centres, which designed a suitable curriculum, arranged the students' practical work exercises in these companies, and even functioned as recruiting agencies for the personnel needed by the companies.

Table 7 outlines what happened in 1974, and the figures are somewhat different. First, the state-owned companies' share was slightly higher, totaling 35.5% of the total for the industrial sector. The most outstanding fact is that one state-owned company, SIDERPERU, was responsible for almost all this (32.7% of the total). However, the cement industry came second with 2.4% of the total, whereas the other state-owned companies only did 0.4% of the research projects.

Because the projects in 1974 were mainly financed with the resources accumulated in the ITINTEC fund during 1972, 1973, and 1974, the sum granted to SIDERPERU should not be taken as corresponding to 1974 alone. Moreover, this apparent disparity is a result of the size of the company, and above all of the fact that it makes very large contributions to the ITINTEC fund.

In 1974, only one project was approved for the paper industry; it was for a private company, I.P. Atlas S.A. (S/1,702,000). Adding the sum granted to Papeles Especiales S.A. (S/180,000) in 1975, the total amount invested in research by the private sector in this field was only S/1,882,000.

Finally, Table 8 provides some information on the relation between the contributions the companies make to the ITINTEC fund and the sums they receive from it.

Table 8 shows that in 1974 the state-owned companies contributed more than

S/43 million to ITINTEC (this includes only the most important and only those with a majority state ownership); this figure is only slightly less than what they received (S/49,276,000) from the fund that year.

Thus, it can be concluded that the private companies help to finance technological research in the state-owned companies. But, as ITINTEC financed the research projects in that year with the funds accumulated over the 2 previous years, the opposite could also be true. In reality, this latter conclusion is more probable.

There are no official estimates, but it is possible to calculate that state-owned companies received about S/80 million of financing from ITINTEC between its founding and 1975, and these companies contributed more than S/160 million to the fund during the same period. In other words, it is probable that ITINTEC distributed approximately 1% of the net income of the state-owned companies among the private firms. Even if these calculations are correct, this conclusion cannot be taken as final. What happened in 1974 shows that this trend could change in the future, with more large projects like the SIDERPERU one in 1975.

Table 8 shows that the contribution made by the state-owned cement companies in 1974 alone (S/7,633,000) covers the total financing they received from ITINTEC in 1974 and 1975 (S/7,592,000), and the state-owned paper industries' 1974 contributions (S/14,865,000) also covered the funds they were granted in 1974-1975 (S/14,896,000).

Technology Consumption in the State-Owned Cement and Paper Companies: This section is based on the chapter dealing with technology in an internal report prepared by The Registry of Industry and Tourism. This report does not differentiate between state-owned and private companies, but as the cement and paper industries are monopolies (at least in the case of paper, as far as producing pulp is concerned) it can be assumed that the data on these industries refer mainly to state-owned companies.

Between 1963 and 1968, the paper and cement industries were not among the most dynamic, neither when all the manufacturing industries are taken into account, nor when compared just with the producers of intermediate goods.

Between 1968 and 1973, the paper industry grew faster and became one of the most dynamic sectors during this period. The opposite happened in the cement industry, for this sector had an apparent recession during 1968-1973, even though a different picture may emerge if figures on total investment are examined in addition to growth rates.

To assess the consumption of technology, it is possible to use the concept of technological modernity employed by the Ministry of Industry and Tourism. This is defined as the index of investments in machinery and equipment expressed in monetary terms compared with the total stock of machinery and equipment. There are three principal levels within the criterion of high investment: first, those sectors with more than S/1,000 million a year; second, sectors with between S/500 and S/1,000 million; and finally, sectors with between S/201 and S/500 million. A modernizing sector or group is one with a high comparative investment index and one in which the total sum invested is also large.

Based on these criteria, the Ministry points out that between 1968 and 1973, the cement industry was "one of the industries with high indexes of modernization, that is, one of those industries whose investments were at least S/1,000 million." Spinning has the highest index, followed by industrial chemical products and fertilizers, iron and steel, and finally cement.

By combining this criterion with that of the volume of investments, it can be inferred that although the growth rate in the paper industry is higher than in the cement industry, the latter has one of the fastest rates of modernization and it surpasses the paper industry.

Therefore, both the cement and paper industries can be qualified as intense and modern in the consumption of technology when compared with the rest of the country's manufacturing industry. Moreover, because these industries have relatively high productivity levels and because they produce for the domestic market, they should have a favourable influence on the industries using their products as inputs. However, a more detailed study of the inputs used in the paper industry is required; Table 9 shows that a considerable proportion of inputs were imported.

The technology used by this industry, as far as its inputs are concerned, is basically derived from the production of cellulosic pulp from sugar cane bagasse, and

from bagasse in general. This is a typical characteristic of the national paper industry. In fact, the national paper industry has been developed in close connection with the sugar industry, because of this input. For this reason the state's efforts to develop the industry are following the path laid down internally by the private firms before nationalization; consequently, the new state enterprises and the research projects are inseparable from the efforts to incorporate this by-product of the sugar industry into the paper industry.

Nevertheless, as Table 9 shows, in 1970 this industry was still very dependent on international supplies for its inputs. No less than 45.5% of the cost of the inputs was spent on imports. Therefore, the "bleached pulp" project offers the best possibilities for reducing this technological dependence in the future.

The Purchase of Technology in State-Owned Cement and Paper Industries: Two different aspects of the problem of purchasing technology should be examined. They are what are often called "incorporating technology by importing capital goods and inputs" and "the contracts to purchase technology."

Around the middle of the 1960s, dependent industrialization in Peru became more intense, and import substitution of durable consumer goods and basic intermediate goods started. This change was manifested in the composition of imports, where the emphasis on finished products was replaced by capital and intermediate goods.

Capital goods for industry began to account for more of the country's total imports: whereas they represented 18% of the total imports in 1965, in 1968 the figure was 22% and in 1973, 27%. The imports of raw materials and intermediate products have varied considerably; in 1965 they represented 38% of total imports, in 1968 the figure was 46%, and in 1973 it decreased to 38% again.

The imports of all three categories did not change percentage-wise with respect to the total in 1968 and 1973. By looking at figures on imported capital goods, it can be observed that the majority of the capital goods are industrial machinery, 65% in 1968 and 64% in 1973. The other types of goods - components and accessories for industrial machines, other fixed equipment, machinery and office equipment, and tools - represent a small percentage. This means that embodied technology is present in two-thirds of the total imports.

Within this general framework, the capital goods imports by the cement and paper industries, and other intermediate goods producers, have been increasing in relative importance during the last decade. However, the quantity of capital invested is only significant in the cement industry. The paper industry imports raw materials and intermediate goods in greater quantities.

#### FISCAL MEASURES

Measures related to the fiscal treatment given to enterprises, sometimes associated with subsidies, price control mechanisms, and credits, aim at modifying the environment that determines business decisions, with the expectation of achieving an effective change in business behaviour. They do so by offering enterprises the possibility of reducing their tax burden, thereby increasing their profitability if they abide by certain conditions established by government to achieve its industrialization aims.

In general these instruments were considered very weak because they usually alter the conditions for business performance only marginally; this becomes rather obvious when one recognizes that they are ex-post-facto mechanisms that are usually present in a simultaneous and redundant form, with many fiscal incentives piling on top of each other. Their rationalization into a single fiscal instrument is virtually impossible because of the broad variety of objectives they pursue. In the STPI studies, the following cases were examined:

- |          |  |
|----------|--|
| Mexico   | - Coefficients of depreciation of fixed assets.                        |
|          | - Fiscal treatment of payments for royalties and technical assistance. |
|          | - Other taxes.   |
| Colombia | - Depreciation of capital goods for tax purposes.                      |

- Tax deduction for expenses in repairing and reconstructing machinery.
- Tax holiday for metalworking industries.
- Venezuela - Fiscal treatment of industrial enterprises.
- Korea - Taxation system.

## MEXICO

The industrial policy of Mexico has utilized fiscal incentives for more than 50 years: in 1926 a decree was issued that established a 3-year exemption from all federal taxes for industrial enterprises with national capital not exceeding 5,000 pesos in gold and 80% of whose employees were Mexicans, and that utilized national raw materials. The next instrument of this type was established in 1939, this time directed at import substitution (the tax exemptions were reserved for enterprises that developed "entirely new" activities). From that moment on, various instruments of this type succeeded one another, differing by slight variations in the amount and duration of the exemptions, in the definitions of "new" and "necessary" industries, in their acceptance or rejection of extensions, etc.

The characteristic features common to them all are the lack of selectivity, the lack of discriminatory treatment for different types of enterprises, the inclusion of the "most favoured enterprise" clause, and others. No instrument was endowed with application criteria concerning increases in efficiency, origin, or type of technology utilized, technical or research activities performed by the enterprises, composition of social capital, etc.

Various fiscal measures relate to expenses directly related to technological decisions. Although these measures might have been inserted into the scope of fiscal policy long ago, they now constitute an instrument that can directly affect the direction of corporate-level technological decisions. Moreover, unlike the criteria for application of some fiscal exemptions, these provisions have indeed had a concrete application. The fiscal measures examined are the following (12):

- Coefficients of depreciation of fixed assets to determine the calculation of the income tax;
- Fiscal treatment of payments for royalties and technical assistance.

Before examining these instruments, some of the features of the Mexican fiscal system in relation to the pertinent problem are summarized. In the first place, striving for economic expansion has kept fiscal pressure relatively low (in particular, that over income derived from capital).

Varied and even contradictory objectives have been assigned to fiscal policy - e.g., obtaining resources for financing state activities; contributing to savings and capitalization (particularly in the manufacturing industry); promoting decentralization and regional development; facilitating renewal or replacement of assets and the importation of capital goods; and fostering exports. Clearly, the battery of instruments of fiscal policy is not responding to a group of coherent objectives for industrial policy: it has been integrated through the response (in different periods of time) to short-term problems.

In this context, the tax structure has been continuously modified during the last 20 years, with income tax continuing to acquire importance.

The income tax rate has been characterized by low progressiveness. Currently, the progressive rate on corporate profits only reaches 42%, applicable to the amount of 1,500,000 pesos. Beyond this amount, the proportional rate of 42% (that is, the highest marginal rate) is applicable.

Taxes are only applied to profits that are actually distributed. No tax is levied on reinvested profits (in the fiscal year in which they are realized, or in the following year) for industrial, agricultural, livestock, or fishing purposes. Nor does the tax apply when profits derived from the sale of fixed corporate assets are directed toward the acquisition of depreciable goods in areas defined as subject to development. It is difficult to determine from the information available exactly to what degree these measures have contributed to increasing the productive reinvestment of profits. Certainly, no control over these funds exists, and this instrument could have increased the



corporate liquidity available for the acquisition of goods without any discernible effect on efforts toward industrial development.

The Income Tax Law (LISR) authorizes the taxpayer to deduct from the taxable amount "normal expenditures of the business." Included among these normal expenses are payments to persons outside Mexico for technical assistance and costs of advertising (totally deductible: 60% in the fiscal year in which they were incurred and the remainder in the following 3 years). Such deductions can be quite high and in practice are extremely difficult to control effectively. The road to tax evasion is wide open.

#### Coefficients of Depreciation of Fixed Assets

For calculation of taxable revenue, firms may make a series of deductions authorized by the Income Tax Law because, in general, they are considered normal or appropriate to the conduct of the business. These deductions include the depreciation of fixed assets. In reality, the concept of depreciation encompasses what is considered the essential part of capital consumption (capital wear-and-tear). Obsolescence is a concept rather different from depreciation, because it implies a reduction in the worth of an asset for technological or economic reasons: if an asset becomes obsolete, the value that has still not depreciated normally will be totally depreciated in the fiscal year in which it is replaced. In summary, it is assumed that wear-and-tear on capital is a normal expenditure of a business and therefore deductible from taxable profits.

Under the Income Tax Law of 1954, the coefficients of depreciation could be modified for fiscal purposes with the authorization of the Ministry of Finance. In 1962, this situation was changed. While the possibility of using coefficients of depreciation higher than those authorized by the Law was explicitly established, this possibility was subjected to the following conditions (those that are observed at present):

(a) The authorization will be made through general agreements (by regions or by branches of activity, types of assets, etc.).

(b) Any firm interested in applying the method of accelerated depreciation ought to obtain a "concrete agreement" from the fiscal authorities.

This instrument seeks to serve as an incentive to bring about modernization of the industrial plant. Corporations can deduct larger amounts from taxable profits, paying less tax during the first years. But the taxable base will increase for the last years; in fact, after having depreciated (for fiscal purposes) the assets in question, they can no longer be considered deductible: the treasury will recuperate what it did not collect during the first years. Hence, this incentive is the equivalent of an interest-free loan that the state offers in the first years and recovers when the balance to be depreciated is considerably reduced. However, a corporation that is authorized to depreciate certain machinery in an accelerated form, and that then sells the machinery once it has been depreciated (fiscally) and acquires new equipment, would find that the advantages of accelerated depreciation continue to benefit the firm indefinitely.

These schemes have been rarely utilized, for the Ministry of Finance has not worked out the general agreements (nor has there been strong pressure from entrepreneurs to see it done). This might be explained by the taxpayers' fear of increased inspection of their activities (particularly their investment plans) by fiscal authorities. Moreover, the presence of idle capacity and of overprotection in many branches of industry brings about a situation in which no pressure to renew equipment exists. Finally, the normal coefficients of depreciation authorized by the Income Tax Law may be sufficiently high for certain industries, and, under the Law on New and Necessary Industries and the Decree of Decentralization and Industrial Development, authorization for accelerated depreciation can already be obtained (see the section on industrial programming).

In relation to the coefficient of 35% for equipment destined directly for research on "new products or technological development in the country," it is necessary to indicate that no criterion of what is meant by these concepts has been established. Apparently, fiscal authorities do not have available the capacity to perform the necessary evaluation so that equipment destined for other uses would not be included under this heading. It is not difficult for a pilot plant to produce resins with commercial uses or for certain instruments to be used for quality.

It is not farfetched to suppose that the incentive to renovate and modernize assets has also been an incentive to speculate. In any case, it is also logical to assume that overcapitalization of productive techniques has been encouraged. Doubtless,

other considerations of greater relevance weigh here as well (relative position of the firm in the field, volume and nature of its demand, dominant channels of competition, etc.), and it is difficult to determine with precision the magnitude of the bias inherent in this fiscal instrument.

Firms in the petrochemical industry use equipment that is assigned a markedly smaller coefficient of depreciation (in fact, more according to actual depreciation). The LISR assigns a coefficient of 9% to the equipment most used by these corporations: reactors, distilling towers, heat exchangers, compressors, various kinds of containers, and, in general, equipment pertinent to continuous process industries. Other coefficients established by the Law are also applicable, the particularly important ones being those for pollution control equipment (35%), equipment destined for research (35%), and modular electronic computer equipment.

In the industries of this branch, maintenance practices considerably lengthen the life and efficiency of equipment. Yet the most important firms in each branch, those possessing greater productive capacity and greater intensity of capital, use maintenance techniques that are equally capital intensive. Once the engineering of a process is acquired from a foreign engineering firm, it is not surprising that the project design incorporates the maintenance techniques most common in the highly industrialized countries.

A consensus was also observed in the branches of the food industry over the suitability of the coefficients to prevailing conditions in the industry.

#### Fiscal Treatment of Payments for Royalties and Technical Assistance

In 1969 the Ministry of Finance completed a study of payments that various firms made abroad for technical assistance. The study was motivated by fiscal preoccupations (basically, the fact that considerable payments were made to countries like the Bahamas, Curacao, Panama, and Liechtenstein, all tax havens, and that payments existed for purpose unjustifiable in terms of the line of business of the corporations; for example, soft drink bottling companies and advertising agencies).

As a result of this study, the fiscal management of payments abroad for technical assistance was reformed. Before 1971, these payments had been taxed at a fixed proportional rate of 20%, much as payments for royalties were taxed at a progressive rate (whose highest marginal rate reached 42%). To eliminate the incentive for companies to channel payments for royalties and for remission of profits abroad as payments for technical assistance, the two concepts were made equivalent in January 1971 and are subject to the progressive tax up to 42%. This measure provoked reactions in the private sector, particularly in the Confederation of Industrial Chambers, which declared that it "did not agree with declaring the payment of royalties a general problem...for in reality 'technical assistance' comes to compensate for our deficiencies in research and experimental development material" (13). On the other hand, it was criticized for placing a mechanism that could be useful for the transfer of technology (as is technical assistance) under the same tax as a channel that occasionally is less effective for the transmission of specific technical knowledge (the case with licences for the use and exploitation of patents, which require payment of a royalty normally calculated over net sales). However, for transnational corporations, the incentive to present profits remitted abroad as technical assistance or royalties continues to exist.

An important element in these problems is that the fiscal authorities lack the capacity and technical support to verify whether it is a matter of a new technology or knowledge. The treatment is the same for all branches of industry and for payments of royalties. No coordination exists to control these aspects with the National Registry of the Transfer of Technology (which, as has been seen, has even authorized contracts in which the taxes are covered by the party that makes the payments) or with CONACYT.

#### Other Taxes

Other aspects of the tax system might come to have effects on technological decisions. The first is the sales tax, a tax with cumulative effects that is applied on each sales operation at its full value without deduction for taxes previously paid. As its effect is cumulative, it favours the vertical integration of corporations in order to avoid taxes caused in each phase of the production process and of distribution. This tends to discriminate against businesses that have labour-intensive techniques, for in general they have a lower degree of plant integration. However, the impact of

this tax might not be the determining factor in the decision of a firm to increase the level of plant integration. One possible explanation is that the tax is borne by the final consumer. None of the 67 firms visited indicated that the tax had been taken into account in increasing the level of integration.

Other taxes that have a negative impact on the use of labour-intensive techniques exist in Mexico. First, there is the federal tax on expenditures for remuneration to working personnel, which assesses 1% against the total of the payroll. This tax revenue was originally destined to aid education. Moreover, certain states have also set local payroll assessments: in Nuevo León, the rate is 2%, and in the State of Mexico, 1%. Clearly, the impact of these instruments is much greater than that of indirect taxes. Also, the social charges for social security and housing have the effect of raising labour costs. The contributions that firms must make to the Mexican Institute for Social Security (IMSS) reach 9% of the value of the payroll; and the contribution to the National Housing Fund for Workers comes to 5%. Thus the cost-increase impact of labour is 17% in Nuevo León, 16% in the State of Mexico, and 15% in a place that has no payroll assessments. However, reforms in the Federal Work Law establish that "contributions to the National Housing Fund for Workers are expenditures of social foresight on the part of corporations" (Article 141) and therefore can be deducted from the taxable total (Article 20 LISR). This treatment is not given to fees for IMSS in spite of interpretations for their deductibility advanced by employers' groups.

Fiscal policy in Mexico has formed part of a strategy of development that has kept the acceleration of the process of capital formation as a central objective. Considerations of generation of employment, choice of techniques, and autonomous technological development have not been given much attention in the formulation of this policy. The measures related to undistributed profits, and to the great number of deductions they permit, considerably reduce the taxable base of the corporations. But the lack of control and selectivity (difficult to incorporate in fiscal instruments) have made this an instrument that is unable to pursue the objectives of scientific and technological policy.

It would be difficult to conclude that the coefficients of depreciation authorized by fiscal legislation have served in general to modernize the industrial plant. Before the existence of high levels of idle capacity in many branches of the manufacturing industry and of excessive levels of effective protection, it is likely that no significant pressure to renew assets existed. It is likely that these coefficients have promoted overcapitalization of production techniques, and in some instances speculation with serious implications has been encouraged. This has been the result of the application of coefficients as high as that for machine tools. In face of the coexistence of significant levels of idle capacity and renovation of fixed assets, it can be concluded that the coefficients of depreciation for fiscal purposes are extremely high for certain branches of industry. Nevertheless, it becomes quite difficult to adjust these coefficients to more realistic levels and almost impossible to define a treatment differentiating among types of industry without having this instrument inserted in a broader framework of industrial and technological development.

The present fiscal treatment is inadequate because under the present system practically any corporate expenditure can be considered as normal to the business and thus can be deducted. Hence, tax evasion is encouraged and the deductibility of research and experimental development expenses fails to provide any incentive because it is unnecessary to carry on such activities to deduct expenditures. Moreover, as fiscal authorities do not have the technical and material capability to verify the content of such activities, expenditures on technical activities more closely linked to production than to the experimental laboratory can be presented as costs of research and development. Furthermore, the instrument lacks selectivity and confers the same treatment on technological developments related to the production of cosmetics or luxury consumer goods as on those related to mining or food production. Finally, the same treatment is given to expenses related to the development of capital-intensive technologies as to those that would encourage the development of more labour-intensive techniques. Clearly, the faults of this instrument also derive from the lack of a broader framework, which might permit the introduction of an element of selectivity in its management. But inefficiencies also arise from the absence of coordination between fiscal authorities and specialized institutions.

The incentive that currently exists to channel profits abroad in the form of payments for royalties or for technical assistance cannot be countered except through

greater control and vigilance on the part of fiscal bodies and the institutions that supervise the formulation and enforcement of policy on the importation of technology: CONACYT and RNTT. This last body ought to establish and enforce the criterion of not permitting payment of royalties for the use of trademarks or technology between wholly owned subsidiaries and the parent firm. Finally, the possibility of deducting payments for royalties and technical assistance ought to remain subject to effective control over their content (at least in those cases where payments exceed a determined amount; for example, more than 2% of net sales). Payments for the use of trademarks should not be deductible unless the product is destined for export.

In terms of the impact of all these elements of the fiscal system on the choice between capital-intensive or labour-intensive techniques, two points are important. The first, and less critical, is the fact that labour's impact on costs has been emphasized in the past without taking into account that the simplistic insistence that "labour's cost has increased 12% or 15%" contrasts with the impact of distorting effects on the price (or, better, the prices) of capital. To what extent is the use of capital-intensive technologies stimulated through the action of other instruments of industrial policy? A corporation can obtain credit from a public financial institution at a preferential rate of interest, or reinvest its profits, which will then not be taxable. It can also buy automatic, labour-saving machinery abroad. This machinery can be imported with a substantial (or total) exemption from the import tax under one of the existing schemes; it can then be depreciated for fiscal purposes by applying the coefficient of 35% (and can be sold in 3 or 4 years as secondhand machinery); and if there are layoffs, the compensation will be deductible from the taxable sum. Obtaining credit for the purchase of machinery is always easier if the item itself constitutes a guarantee. But how can a small firm guarantee a loan to increase its payroll? Clearly, distortions also exist in the price of capital (whether it is understood as financial capital or as goods utilized in production, that is, capital goods), which make it fail to reflect its true scarcity.

The second point is that decisions over the choice of techniques are conditioned by a number of elements and not only by differences between the relative prices of the primary factors.

Other considerations are more important in many industries. The structure of the branch, the scale of production, the channels of competition, the nature of demand, and the rigidity of substitution among factors are elements of great significance in the choice of techniques. Even the price of services such as power and water can form a fundamental variable: in process industries, an important factor in choosing between continuous-flow or intermittent technologies is the critical consumption of these services. But if these services are subsidized, the incentive to select a technique that saves them can be weakened. All these aspects have been ignored in Mexico, but they clearly show the need to articulate technological policy with industrial policy.

## COLOMBIA

### Depreciation of Capital Goods for Tax Purposes

This is a recent Decree-Law that established that for tax purposes capital goods could be depreciated over a period of 5 years, whereas previously this period was 10 years.

It aimed at accelerating the depreciation rate for accounting purposes. This rate does not coincide with the real depreciation rate, especially in Colombia where, due to import costs, a machine frequently has an economic life 5 or 10 times greater than the one presented by catalogues. The formal objective is to accelerate the process of machinery replacement and to facilitate the import of new capital goods for entrepreneurs.

This decree influences companies in general and especially those that must rely heavily on machinery and equipment as a basis for their productive process, i.e., companies using capital-intensive technologies.

The results of these measures cannot be evaluated because they were enacted only a short time ago. However, they could provide effective incentives for the import of machinery and equipment, although that depends on broader policy decisions of the enterprises regarding the use of the additional profits they have derived.

### Tax Deduction for Expenses in Repairing and Reconstructing Machinery

Contradicting the previously discussed instrument, this instrument is aimed at extending the productive life of the equipment to reduce the payments abroad for new capital goods. It is one of the key policy instruments that have played an outstanding role in Colombia in shaping the process of technological development within the import substitution strategy.

This policy instrument, combined with that of the now-abolished depreciation of capital goods over a period of 10 years and with the import restrictions on equipment and spare parts, exerted a formidable pressure on the enterprises with high investments in industrial equipment to build up internally their maintenance and repair capacity. A significant technological capacity and know-how started to grow around the maintenance and repair shops of large enterprises in which the investments in fixed assets represent a high or significant proportion of the costs of production (for example, the textile, beer, and glass industries). The fiscal reform of 1974 eliminated this tax instrument.

### Tax Holiday for Metalworking Industries

The main objective of this Law issued in 1960 is that of promoting the development of the metalworking industry in Colombia. It is a Law of the Republic and favours a specific industrial branch during a fixed term of 15 years. This Law is not likely to be renewed. Its main objective is the establishment of a tax holiday for those enterprises in the metalworking branch of production, including all the textile factories that have converted their factories into metalworking enterprises.

It had a transitory effect upon the metalworking branch of industry and all the firms conforming to it, but its effect was very slight over the entire sector because it created a set of special conditions for a specific branch of industry.

This policy favoured the displacement of industries that belonged to the textile sector by the metalworking branch of industry. These new enterprises have thrived through the manufacturing of equipment not destined to the textile industry: lathes, reducers, drills, large valves, etc., because these goods enjoy a satisfactory tariff protection. One of these enterprises started manufacturing looms 6 years ago. A North American trademark and licence was employed and the resultant quality of the product was very good. These looms are still being manufactured but only as a secondary line of production.

To take advantage of the tax holiday offered by this Law, those enterprises decided to convert their large maintenance and repair shops into separate metalworking firms. This is one of the main origins of the Colombian capital goods industry. Another important origin of this industrial branch is the establishment of maintenance and repair shops for the Colombian railroad network, which was created toward the beginning of this century.

Technologically, this was not of great importance because it only slightly shifted the attention of the enterprising sector, which seldom decided to introduce real innovations in certain production lines.

These industrial incentives based on "take-off" subsidies have proven to be relatively inefficient in Colombia. Therefore it is to be expected that they will be substituted by global industrial-incentive policies based on a system of priorities. This same inefficiency applies in terms of technological development, which is favoured only as a result of the attention granted by the enterprising sector.

## VENEZUELA

### Fiscal Treatment of Industrial Enterprises

Among the mechanisms for taxation employed by the Venezuelan state, direct taxation of a firm's income is of special interest for this module. The utilization of this type of taxation as an instrument of economic policy largely depends on its relative importance within the general taxation structure.

According to data from the Ministry of Finance these taxes represent less than 65% of total public revenue, including oil revenue of nationalized firms, and only 10% if oil revenue is excluded. This situation has permitted the creation of a fiscal

structure very favourable to the use of these taxes as instruments of economic policy. In effect, leaving aside the small 10% contribution to the current financing of the state apparatus, there are numerous possibilities for using them as mechanisms to stimulate or inhibit given economic activities (14).

Until now, the state's criterion when using this type of taxation as an instrument of economic policy has been that of using it to stimulate or promote and not to inhibit given activities. In other words, within the limits established by the Income Tax Law, use has frequently been made of exemptions and exonerations but never of tax increases (15).

The expansion of the local productive apparatus has been the central aim in the manipulation of these taxes as instruments of economic policy. Within this general aim, the fundamental goal is to stimulate the displacement of capital toward one or another region or economic activity (the improvement of resource allocation through the increase in capital mobility). As a result, objectives such as full employment, price stability, and improvement in the balance of payments have been permanently in second place despite the fact that they often appear to justify the use of these taxes.

The application of this tax mechanism in the manner shown - which can be clearly seen in the way in which exemptions and exonerations are established and approved - has accelerated the process of capital accumulation by firms at the expense of expanding the industrial productive base. At the same time, income distribution, internal market expansion, regional development, etc. - all important in terms of a global development policy - are relegated.

Until now the state has never used direct taxation of a firm's income as an instrument of scientific and technological policy. This type of taxation, without any consideration for scientific and technological development, indirectly has had negative effects on the latter. The use of this form of taxation as an instrument of economic policy has contributed to the increase in the existing tendency toward the indiscriminate importation of technology.

The above is explained in terms of the model of industrialization by import substitution. Such a model is characterized during its early stages of evolution by the necessity to import technology embodied in machinery and equipment so as to construct a productive apparatus capable of satisfying the demand pattern previously covered by goods from abroad.

Within the general ideas put forward here, more careful consideration should be given to the system of taxation on firms so that a closer assessment can be made of the repercussions and possibilities of this tax mechanism on national technological development, in particular in relation to the depreciation of machinery and equipment.

The reserves for depreciation of machinery and equipment used in the productive process are income tax deductible. These reserves include expenses relating to the wear and tear of fixed assets and are subtracted from the total income of the firm, thus reducing the net amount of taxable income.

Since this type of expense is transferred to the value of the firm's current production, it is clear that this encourages the latter to reduce the formal period of probable productive life of the machinery and equipment and/or to increase the amount depreciated annually, because it allows faster recuperation of the investment in capital goods and offers the possibility of improving productive efficiency through new investments in the same firm or other economic activities.

In some countries there are quite precise legal mechanisms that allow the use of the depreciation reserves as instruments for stimulating new investments and for modernizing the firm. The accelerated depreciation and/or the reduction of the fiscal life of capital goods explicitly contemplated by these mechanisms favours these objectives by allowing fast recuperation of investments, diminishing the net amount of taxes and maximizing the financial profitability of investments.

From this point of view, the use of depreciation allowances in the way shown above is equivalent in practice to giving the firm a "loan" that the state can recuperate at the end of the fiscal life of the machinery or equipment thus financed, but that will never be recuperated by the state if the firm, at that moment, decided to acquire new equipment or a new machine. In Venezuela there have never been incentives based on the concession of accelerated depreciation and/or reduction of the periods of probable productive life of capital goods.

However, it is important that to the extent that the present Income Tax Law confers discretionary powers on the institutions that supervise its application, it offers possibilities for firms to exert pressure so that they can manipulate the depreciation reserves of their balance sheets in a form consonant with their particular interests. Thus the firm always has the chance to justify why it considers as reasonable a given period of probable productive life of one or another type of machinery or equipment through employing different criteria to depreciate identical pieces of equipment according to the productive function of each and often even the department using each one.

Various other factors together make this the most rational method of procedure from the microeconomic point of view. Briefly, these are described next.

If the aim is to minimize production costs, the firm will replace machinery and equipment if the new investment and new labour costs associated with the change compensate, from the point of view of profits, for the cost incurred in the maintenance and repair of the existing machinery and the present labour costs. This is somewhat schematic, but given the situation in Venezuela, the accelerated depreciation of capital goods tolerated by the current Income Tax Law contributes to encouraging the firm toward the first of the above alternatives, that is to renew its fixed assets rather than prolong their use. There are various reasons operating in favour of this.

The first of these has to do with accounting procedures. By shortening the fiscal life of productive goods, the firm substantially diminishes its taxes and, as pointed out above, enjoys a sort of credit, which it does not have to pay off if it pursues a policy of continuous renovation of fixed assets.

On the basis of the analysis made, the principal consequences of the manipulation of depreciation reserves for the technological development of Venezuela can be indicated:

(a) The rapid modernization of the industrial sector is favoured but not as a result of market pressures. The national market is characterized by its reduced size, overprotection, concentration, etc. These characteristics lessen the importance of the renewal of machinery and equipment as a means to defend or improve the firm's competitive position.

(b) Continuous massive importation of embodied technology is induced, primarily in the form of capital goods.

(c) Technological learning on the part of local firms is not stimulated. There is no pressure for the significant development of equipment maintenance and repair activities, and the progressive training of labour directly related to machinery operation is made difficult.

(d) Another factor is therefore added by the fiscal system to those that encourage the overmechanization of Venezuela's industries.

## KOREA

### Some Remarks on the Tax System

During the last decade, government investment expenditures ranged from 3% to 6% of the GNP, national defence expenditures from 4% to 5%, and general government expenditures from 5% to 7%. Total general government expenditures ranged from 11% to 18% of the GNP. Approximately two-thirds of these expenditures were financed by indirect taxes on goods and services and one-third by direct taxes such as income taxes on individuals and corporations.

In 1973, indirect taxes on goods and services amounted to 8% of the GNP, direct taxes to 4%, and local taxes to 1.4%. The total tax burden amounted to 13.4% of the GNP.

At present, indirect taxes are collected under 10 different tax laws with some 80 differentiated tax rates ranging from under 1% to 250%. The market prices, therefore, are seriously distorted by taxes. A distorted price structure cannot serve as an efficient information system that leads to an optimum allocation of resources in the market economy. This distortion could be eliminated if all indirect taxes were unified into a value-added tax with a single rate and a minimum of exemptions.

The Korean government has been preparing for the introduction of a value-added tax since 1972. A feasibility study was done in October 1972, and various administrative

preparations were underway in 1975. Implementation is expected to begin within the next few years.

At present the corporate income tax law gives a tax credit on the spending for research and development activities commissioned to established research institutes such as the Korea Institute of Science and Technology. But its effect seems to be weak. Since corporate income tax is charged on profits, it penalizes firms that could be efficient and also could contribute to technological progress, while inefficient firms making no profit are not liable to pay tax. If corporate profit taxation were absorbed by a value-added tax, the unintended subsidy to inefficient firms could be eliminated.

### PRICE CONTROLS

The effects of price controls cannot be clearly defined. They can increase profitability in a given industrial branch if it is a question of a guaranteed minimum price, or vice versa they can decrease profitability if it is a question of a maximum price. But in both cases, depending on a number of other factors, price controls can lead to greater technological efficiency, either because they increase funds that could be invested in technological improvements, or because the price rigidity can help induce the introduction of cost-saving innovations or improvements.

The only case examined in the STPI project was the Colombian price control mechanism. In this case, it was found that under conditions of price controls and because of the many rigidities that surround other decisions, one of the options open to entrepreneurs is to adopt a policy of technological improvements aimed at optimizing the already-installed equipment and machinery, thus reducing fixed investments per unit of output and accelerating capital rotation and therefore their profitability. This possible source of minor technical improvements is seldom looked at.

### COLOMBIA

#### Price Control Mechanism

The price control mechanism is applied by the National Prices Administration of the Ministry of Development to regulate the price of some products. There are three general principles on which this government policy on prices has been based.

The basic principle states that all goods considered as basic must be submitted to price control. The purpose of this measure is to control the prices of all those products that affect to some extent the so-called "canasta familiar" (wage goods). Although this fundamental principle has been for many years the basis of all government price control policies, in recent years it has lost much of its importance. This has been partly due to the use of other policies that have contributed either to increasing competition or to improving all distribution systems, with the consequent effect on the prices of basic consumption goods.

The second principle on which the price control policy is based is that all those market imperfections that may contribute in one way or another to increasing prices must be controlled through price control on some inputs. Such is the case with all veterinarian products, which remain under price control, whereas other inputs such as barbed wire may vary considerably, causing a continuous decrease in the price of the former in relation to other inputs, thus making their use more attractive to the entrepreneur.

A number of products that were under price control since 1970 have been gradually taken out of the list because of the enormous difficulties encountered by the government in exerting adequate control at the consumer level. At present, other regulatory instruments such as import liberation and IDEMA (subsidiary distribution) are being used. In cases of great scarcity, the control policy is totally inefficient, giving rise to speculation or contraband.

The price control policy does not consider at all the technological factor; nevertheless, because of the extent to which it affects the incomes of all enterprises and their earning power, it forces some enterprises to modify their behaviour. This principle refers to the control of monopolistic prices. Nevertheless, it has been extended in practice to the correction of other types of market imperfections such as



oligopoly. Likewise, the price control policy has been used to correct market deficiencies not only in the production of goods and services but also in their distribution. The above-mentioned use of price controls is a true innovation introduced during the previous administration because, before then, prices were controlled at the factories only, thus ignoring the possible effects of the distribution process.

The third principle on which the price control policy is based states that this control may be justified whenever it is desirable to obtain a distributive effect and there are no other plausible means to achieve it. The most common distributive effect is one that contributes to progressive income distribution. Perhaps the best example of this effect is the rent freeze, in which the less wealthy are supposed to benefit the most, to the detriment of the wealthier who seek to benefit from the rental of their properties.

Besides the distributive effect on income, there may be a distributive effect on production factors.

A special paper written by Dario Abad for the Colombian STPI team analyzed this question in some detail. He states that in the Colombian price control system, which takes into account unit cost and capital rotation, the alternatives open to the entrepreneur are:

- to leave business altogether, as seems to have frequently happened with milk products;
- to diversify production, shifting toward products where price controls do not exist, which seems to be the most common response, in particular in pharmaceuticals and food products;
- to lower product quality (or diminish batch quantities, as in the case of match boxes);
- to change the declared assets of the firm to artificially increase unit costs and demand a price revision;
- to adopt a technological policy aimed at a better utilization of already-installed equipment and machinery, thus reducing fixed investments per unit of output and diminishing total fixed costs per unit of output. With such policies a firm can achieve lower unit costs and faster capital rotation, thus improving its profitability, which was restricted by price control.

Obviously the latter is the most difficult and long-term option. For this reason the private entrepreneur will adopt one or a number of the various strategies mentioned above. However, in companies having certain characteristics, the effect of price control on technological management is clearly discernible. The following working hypothesis can be formulated:

"All productive activities that are submitted to a price control policy will in time opt for the technological strategy if the following characteristics exist:

- (1) Price control is maintained for long periods of time, price readjustments are infrequent, and the tendency of the government is to maintain artificially low prices or political prices.
- (2) The production process is capital intensive and therefore involves considerable volumes of production requiring considerable investments in fixed assets.
- (3) Production is specialized and not versatile, i.e., it is difficult to alter the line of products by substitution.
- (4) The company operates in a highly concentrated market, i.e., in monopoly, oligopoly, or cartel conditions.
- (5) The products are subject to universal quality standards and it is difficult to alter their quality while maintaining their market acceptance."

Although the price control policy does not have the specific aim of obtaining good technological management of the companies, it seems evident that it has a significantly beneficial effect on the technological management of companies with certain characteristics.

This remains, however, a mere hypothesis, but it is a hypothesis that appears to be supported in Colombia by the existence of certain productive activities in which good use of installed equipment, low fixed costs per produced unit, and high productivity levels have been achieved.

## EXPORT PROMOTION MEASURES

Most of the developing countries that have achieved a certain degree of import substitution industrialization have attempted to break their growth bottlenecks both by encouraging exports or by increasing import substitution.

Export promotion can consist of assembling a number of other instruments aimed at concentrating protection of, and assistance to, those industries more likely to penetrate some sections of the world market. In such a policy the effects in terms of technological development can be ambiguous. Some STPI teams, such as the Mexican one, argued that export promotion measures cannot be successful unless the industry under consideration is reasonably efficient, which implies that even at a home market level it can produce cheaper and better products than competitive foreign products. The different views arise from the fact that most governments aim at improving efficiency by means of widening markets instead of widening markets by means of improved efficiency.

On the other hand, as shown in Korea, the success of export promotion policies under the conditions of the post-World War II economic boom can be transformed into an economic crisis as serious as the one present in countries that did not succeed in promoting manufactured exports. The balance of payments problems, the consequent growth of external indebtedness, and the growing protectionism of advanced industrialized countries have put the Korean economy in a critical situation. Scientific and technological considerations in such a situation acquire a totally different nature. They are more costly in immediate terms, although their benefits could be most important in the medium and long term. The possibilities of developing indigenous technologies might be limited for the time being to engineering efforts aimed at improving plant utilization and raw materials and at energy savings. (It should be noted that because of the closely knit character of the Korean policies, export promotion measures have to a large extent been discussed in the section on instruments for industrial programming and for setting industrial priorities.) The cases studies in the STPI project and summarized here are:

- |           |  |
|-----------|--|
| Mexico    | - Fund for the promotion of exports of manufactured goods.<br>- Indirect tax rebate certificates for exporters of technology and services. |
| Brazil    | - Export promotion instruments.  |
| Korea     | - Export inspection law.   |
| Peru      | - Nontraditional exports fund.   |
| Argentina | - Special credit system to promote exports.  |

### MEXICO

#### Fund for the Promotion of Exports of Manufactured Goods (FOMEX)

Established in 1963, FOMEX seeks to finance the export operations of national producers, to protect them in face of the risks implicit in this type of operation, to back import substitution, and to aid exporters of technology and services. Initially, the Fund was sustained by resources drawn from the application of a 10% ad valorem tax on imports of luxury articles and some undefined portions of the tariff.

Currently, its source of funds is the establishment of a rate of 1% on all imports except agricultural products (as of January 1, 1975). It has also obtained credit lines for more than \$40 million with the Interamerican Development Bank and private U.S. banks. FOMEX operates by rediscounting the documents of private commercial banks that earn 3% of the total amount of each operation for serving as intermediaries (but, in effect, the resources committed are the Fund's). Of course, many banks favour offering these preferential credits to firms in the industrial group to which they themselves belong.

FOMEX undertakes the following activities: financing sales, preexport credits, and import substitution. Up to 1975, these operations represented 76%, 21%, and 2% respectively of the total funds handled by the Fund. These resources have represented a growing proportion of the exports of manufactured products in Mexico. From 1964 to 1975, the percentage of the total exports of manufacturers financed with resources from FOMEX grew from 1.7% to 34.6%.

Most credits were destined to traditional exports of the Mexican manufacturing industry. In fact, FOMEX has been an important support for the export of manufactures, but it has not led the growth of sales abroad. It has limited itself to passive support of the export of manufactured goods without selecting industrial branches to which it could offer high-priority support.

The only criterion the Fund pays attention to when granting credit is the percentage of national integration: 50% for exports and 60% for import substitution. This criterion is merely formal, for it is almost impossible to verify the degree of national integration. On the other hand, the intervention of the Fund takes place after the decision to export has been taken and, therefore, it cannot influence the mode of production.

An additional aspect of the operations of FOMEX is its impact on the export of engineering services. Many engineering firms have used the services of the Fund to offer integrated packages of engineering and financing in international biddings. Contracts that otherwise would have been lost were awarded to Mexican firms on account of this support.

The operation of the Fund through private banking complicates the selective application of credits and the regulation of aspects such as the structure of equity, the relations with research and experimental development centres, and the royalties paid for foreign technology.

#### Indirect Tax Rebate Certificates for Exporters of Technology and Services (CEDIS)

This mechanism is aimed at encouraging exports of technology and management services, construction, and the operation of special services.

Since 1971 the policy of promotion of exports has utilized the system of rebates of indirect taxes. The most important indirect tax in Mexico is the sales tax, which is levied in general on all merchandise transactions at the rate of 4%. Its cumulative effect on the final price has been calculated by the Ministry of Finance as 11% on the average for manufactured goods. Exporters can request and obtain Certificates of Rebates of Indirect Taxes (CEDIS) with which they can pay the total of this rate when the exported product has a national component higher than 60%, and half of it (5.5%) when the national component falls between 50% and 59%. The Certificates can be utilized to pay taxes of any kind charged to the company that obtains them.

This instrument was extended in 1973 to benefit the exporters of technology and management services, construction, and operations specified in a contract. The concept of technology is the same as in the law concerning the National Registry of the Transfer of Technology. The basis for the rebate is the value of the services that, by contract, the exporting firms offer to private or public foreign institutions. If the Mexican component in the contract is 50% or higher, the refund is 100% (thus, CEDIS will be equivalent to 11% of the payment), and if the Mexican component is less than 50% but greater than 40%, the rebate will only be 50%. When the Mexican component is less than 40%, the rebate is given at the rate of 100% but only in cases where national inputs are involved. From the beginning of 1973, an additional rebate of taxes of 4% was given when the exportation was carried out by export consortia and service companies. For machinery and equipment (as well as for other products) that are included in the contract, the fiscal stimulus of the conventional CEDIS can be obtained. The exporters must be Mexican citizens if they are individuals, or the majority of capital must be Mexican in the case of firms.

In order that this benefit be reflected in the most critical phase of an industrial project subject to bidding, the agreement stipulates that the Ministry of Finance must make its decision in the shortest time possible, but always prior to the bidding. This permits the incorporation of the rebate in the estimates. Furthermore, it concedes the "maximum tax allowance in force" when introducing into the country the machinery and equipment utilized in the implementation of a contract abroad (under the condition that this machinery has not benefited from CEDIS and that it is utilized for at least 12 months). The maximum tax allowance in force today amounts to as much as 100% of the import tax and therefore represents an important advantage. Machinery acquired abroad can be imported tax free and utilized in other projects (instead of having to be sold in the international market for used machinery).

Clearly, civil and industrial engineering firms are the principal beneficiaries

of this incentive. In fact, the instrument was created precisely at the insistence of various civil and industrial engineering firms and of the National Association of Engineering Firms (ANFI). At the beginning the possibility of establishing some kind of protective mechanism that favoured local firms was considered. But this mechanism turned out to be very risky, for it was considered that the demand for engineering services might remain unsatisfied. The result was the creation of the Certificates for exporters of technology and services (16).

The instrument is too new to be able to evaluate its effects. However, an important conclusion can be advanced. Stimuli of this kind can form an important element in the change of strategy that has come about in firms commercializing their technology abroad. In the past, the technological developments of national corporations have been commercialized on the world level through highly specialized foreign corporations. Such is the case with the HYL process of direct reduction of sponge iron. The case of the other corporation that is currently commercializing a process - producing paper by beginning with waste pulp from sugar cane - is totally different. Indeed, Bufete Industrial has become the exclusive world agent for the Bufete Industrial-Cusi process. The CEDIS for exporters of technology (and the additional CEDIS for operations through consortia) can in the future encourage this sort of strategic consideration of the commercialization of technology without intermediaries. In fact, 24% of the value of the refunds until February 1975 was related to operations realized through a consortium.

In any case, it is appropriate to question whether these incentives will give national engineering firms the capability for basic engineering that is so greatly needed from them. The formal incentives consisting of increasing corporate liquidity might have less impact than a stimulus consisting of a close linking of these firms with the investment programs of the public sector.

## BRAZIL

### Export Promotion Instruments

Export promotion instruments in Brazil are aimed chiefly at the use of idle industrial capacity in the country, and thereafter at the promotion of industrial development.

The first incentives created were (a) the new regulation of the "drawback" system, which, although set up by the Law of Customs Tariffs of 1957, was only implemented in June 1964; (b) exemption from the Industrialized Products Tax in November 1964 (at the time, consumption tax), which was only regulated in October 1967; and (c) exemption from income tax (deduction from the taxable profit of a portion corresponding to the percentage exported), regulated in October 1965.

The government also created the National Council of Foreign Trade (CONCEX) and established a wide system for export financing: in the Brazilian Central Bank, the Fund for Export Financing (FINEX) provides the funds with which the Bank of Brazil - through the Foreign Trade Department (CACEX) - can finance exports and production for exports, as well as other related operations.

In 1967 the system of incentives was enlarged, with the creation at the Central Bank of a special line of refinancing aimed at supporting financing contracts related to the production of manufactured goods for export. Moreover, the 1967 Constitution itself established the exemption from the Tax on the Circulation of Commodities for all exported manufactured products, a disposition that was regulated in 1968. But the vulnerable point of the policy of export promotion was still the exchange policy.

The policy of readjusting the exchange rate at long intervals - usually a large readjustment and belated in relation to inflation - was a serious factor creating discouragement and insecurity for the exported goods. Because of that, the adoption in August 1968 of the flexible exchange rate (in reality, a system of small devaluations at short intervals) can be considered the keystone of the system of incentives to exports. It gave the assurance, previously lacking, that exporters would not see their revenues deteriorate in real terms on account of a possible exchange overvaluation. And it had historical connotations, as exporters were freed from a burden that had inhibited their growth for many years and, as a consequence, the growth of Brazilian foreign trade as a whole.

In the second half of 1969, CACEX consolidated in a single instrument the mechanism of financing exports. The system consisted of the following types of operation and corresponding financing mechanisms: (1) financing production for exports, comprising the productive cycles at short terms and at terms beyond 180 days; (2) financing the exports proper, comprising short-term operations and medium- and long-term ones (180 days or more); (3) financing by CACEX of exports to be paid by the foreign importers, when they in turn have sold the commodities, comprising capital and durable goods; (4) financing, also by CACEX, of commercial promotion and marketing, comprising market studies and analyses, publicity and diffusion, participation in fairs, setting up of representation abroad, and so on; and (5) financing, still by CACEX, of the sale of services abroad.

Later on, in April 1971, the Central Bank established that the banks entitled to operate with foreign exchange could refinance the export of capital and durable consumer goods, as well as the sale of technoeconomic and engineering studies and projects made for undertakings abroad, up to the limit of 85% of the value invoiced. CONCEX consolidated and perfected the system of financing by CACEX for the export of manufactured products with resources from FINEX; the system comprised two types of operation, each with different forms: the financing of exports and the supporting of complementary financing.

In mid-1972 new incentives were created, aimed at attracting investments to increase productive capacity for export as well as to constitute exporting commercial enterprises. At first the incentives were directed at enterprises producing manufactured goods that presented special export programs, under the condition that they abide by certain directives. Those incentives consist of the following:

(1) There is an exemption from import and IPI (industrialized products) taxes, up to the limit of one-third of the net value of the annual average export of manufactured goods predicted in the enterprise's export program (here it was possible to include expenses related to freight and insurance, when paid to national enterprises). In this incentive, imported capital goods related to the incentives administered by the Ministry of Industry and Trade (MIC) cannot be included.

(2) The goods to be imported are not subject to the Law of Similarity (which requires a special procedure to import goods when similar ones are produced domestically); but these imports should be approved by MIC in the case of capital goods, and by the Council of Customs Policy (CPA) in the case of intermediate goods and raw materials.

(3) Tax benefits not totally used in a certain year can be transferred to following years, up to a maximum of 3 years.

(4) The transfer of the tax credits (IPI and ICM) previously established is allowed between enterprises of the same economic group that has presented an export program.

(5) Enterprises are entitled to reduce from their taxable profits the portion corresponding to the export of manufactured products equal to the portion of production that was exported.

With the purpose of administering these new incentives and with the power of stating a conclusive opinion about their granting or not, the Commission for the Granting of Tax Benefits to Special Export Programs (BEFLEX) was created in late 1972. The Commission's conclusive view should be sent to the Finance Minister for him to decide, and the same applies to the applications asking for an anticipation of the benefits granted.

The set of measures of incentives to the growth of installed productive capacity directed to the export market was further enlarged later on. The government established the exemption from the "investigation of similarity" - required by the Law of Similarity - for the importation (thus exempted from the import and IPI taxes) of complete industrial sets fully working in their countries of origin, under the conditions that (a) once brought into Brazil, their production is directed essentially to export and (b) their entry into the country is approved by the President of the Republic, advised by the Ministers of Finance and of Industry and Trade.

The evaluation of the industrial set is done by CACEX. The sale in the domestic market of an annual portion of the production established before the industrial ensemble is imported into the country is allowed only in the extreme cases of nonexistence or insufficiency of similar national production or when an exceptional internal or external

conjuncture made this sale advisable. It is also stressed that these industrial ensembles will benefit from all the tax advantages applicable to the export of manufactures.

The next most important step was the setting up of incentives to the creation of trading companies, although obviously not directly related to the growth of industrial production aimed at export. The beneficiaries are intended to be small and medium-sized producers, who, on their own, would be the least able to promote the commercialization of their products abroad, absorbing all related expenses. The incentives to the formation of trading companies were also created late in 1972 and they extended to the producer-seller the tax benefits granted by law as incentives to export. The most important of these incentives allows the exporting commercial enterprise to deduct from the profit subject to income tax an amount equal to the difference between the value of the manufactured products bought from producers-sellers and the FOB value in national currency of the sale of the same products abroad. In March 1973 the government regulated the formation of these companies; it established norms about minimum capital, it liberated part of the compulsory deposits of commercial banks with the Central Bank to allow them to buy new shares of national exporting commercial enterprises as well as to offer the latter the necessary financial support, and it created a special line of rediscount.

As a conclusion, it seems undeniable that the promotion and diversification of exports - by means of a system that successively withdrew the burdens weighing on exports, subsidized them and finally directly encouraged the growth of productive capacity - contributed to the resumption and maintenance of industrial growth in the 1967-1973 period. At first the utilization of possible margins of idle capacity in industry was promoted; some industrial sectors began to grow as a function also of their exports; and finally, both because of the increased profitability and as an answer to direct stimuli, new investments gave dynamism to the industrial activity geared to exports.

## KOREA

### Export Inspection Law

The purpose of the Export Inspection Law is the improvement of export products and the guarantee of their quality standards. This Law requires that certain designated commodities can be exported only after they have been duly inspected and passed by the government or private testing laboratories approved by the government.

The Law specifies the procedures for establishing the type and methods of inspection for different products. According to the past performance in export and the number of claims, it is possible to allow total exemption from inspection or self-inspection at the industry. The enterprises with foreign investment exceeding 50% and exporting all of their products are also exempt from inspection. The major operational mechanism of this Law is the requirement that certain designated commodities can be exported only after inspection at the test laboratories. A violation of this clause is punishable by law.

As the Korean industrialization strategy is centred around export promotion, the policy instruments discussed earlier under Industrial Programing are also pertinent to this section.

## PERU

### Nontraditional Exports Fund

Decree-Law 19,625, issued on November 28, 1972, is directed at the industrial sector and aimed at financing nontraditional exports, that is, those that have had a certain degree of processing and are classified as manufactured goods. It is a legal provision ordering the establishment of a special fund for financing those exports, administered by the Industrial Bank. The explicit aims of this Fund are:

- to finance the manufacture of the product for export;
- to give financing to the buyer;
- to acquire export reimbursements;
- to grant special guarantee endorsements, letters of guarantee, bonds;
- to finance the opening of markets by opening credits;
- to finance market studies, participation in fairs, publicity, etc.

Loans for nontraditional exports rose considerably after the establishment of the Fund, going from S/163.2 million in 1971 to S/2,640.5 million in 1973. A large proportion of these loans was concentrated in a small number of products, especially fishing vessels. In 1972 these vessels absorbed 69% of this type of loan and in 1973, 57%. The reduction in the total amount of this type of loan in 1974 was due to decreased production by the shipyards. No overall evaluation of this recently created instrument is available in the Peruvian report.

## ARGENTINA

### Special Credit System to Promote Exports

Under the control of the Central Bank a special credit system was created in Argentina for financing promoted exports with deferred payments. This credit system is directed at industrial and mining enterprises that, in the Bank's view, present adequate administrative, technical, economical, and financial capacity to produce articles or render services that fit the requirements of the international market and have a satisfactory history as to "seriousness" and "competence." Also, the special credit can be addressed to consulting enterprises for technology or for research studies related to industrial and mining activities performed with "serious and efficient professionalism."

This system operates by accepting drafts resulting from sales abroad with deferred payments for technical services, research, and studies performed by scientists, technicians, or enterprises, or institutions or teams under the direction and responsibility of technicians or scientists residing in the country.

It is therefore a mechanism that facilitates financial conditions in transactions involving the sale of technical services abroad and is entrusted to the banking system. It operates in isolation, because there are no other mechanisms through which opportunities for the export of technical services are searched for or induced. It works only *ex post facto*.

## OTHER MECHANISMS

The pattern of demand for technology is also influenced by the action taken by the relatively large enterprises to foster the development of the smaller industries that supply it with inputs and components. A policy instrument of this type was identified in India.

## INDIA

### Development of Ancillary Industrial Activities

In 1960, a separate Ancillaries Division was created in the Small-Scale Industries Development Organization (SSIDO); it had the aim of inducing large enterprises to subcontract, and it used incentives rather than compulsory measures. SSIDO has organized exhibitions and seminars to bring together the large and small units and has arranged for special studies in different states to ascertain the scope of development of ancillaries. The establishment of a number of industrial estates providing basic infrastructure and services is also a move in this direction.

Even though the development of ancillaries involves both public and private enterprises as main promoters, during the Fourth Five-Year Plan, the government requested the public sector undertakings to take the development of ancillary industries seriously. Also, at the time of awarding the licence to produce, the large undertakings are asked to spell out the items that they propose to farm out. There are now as many as 10,000 small-scale units supplying ancillary items, such as components, subassemblies, and tooling. In addition, all units set up primarily for the replacement market also fall under the ambit of ancillary industries. During 1970-1971, the value of parts and components produced by the ancillary group alone amounted to nearly \$50 million, and the development of ancillary industries is bound to grow with the development of the economy.

The government guidelines for the growth and development of ancillary industries by public sector enterprises, established in 1971, include, among others, the following

provisions:

(a) A formal resolution should be adopted immediately by the Board of Directors, committing the enterprises to a program of developing ancillary industries.

(b) A full-time officer in the senior management level, not below the rank of a deputy general manager, should be appointed as Ancillary Development Officer, whose primary responsibility should be the development of ancillary industries.

(c) Particular lines of production and items of manufacture should be identified and earmarked as being of topmost priority, so as to off-load their production to ancillary industries without delay.

(d) A survey of existing ancillary units should be made and a list of priorities for development should be drawn up indicating the new units that need to be set up and the improvements that need to be made in existing ones.

(e) Publicity and propaganda should be undertaken for disseminating information on various aspects relating to ancillary development.

(f) An Ancillary Development Advisory Committee should be constituted to select as members entrepreneurs consisting of the Chief Executive of the Enterprise, representatives of the Development Commissioner, Small-Scale Industries, and the Ancillary Development Officer of the enterprise. The initiative is, however, to remain with the Development Commissioner, Small-Scale Industries.

(g) The public sector enterprises should take on the responsibility for providing technical know-how and managerial guidance.

(h) The parent enterprise should be responsible for providing to the ancillary industry the imported/scarcely/critical raw materials, drawings, tooling, process quality control equipment, training facilities, and maintenance of equipment, including the supply of spares and plant/machinery on sale from its own factory, to the maximum extent possible.

A survey was conducted to evaluate the impact of these provisions. The survey identified two distinct patterns: one in which a symbiotic relationship exists between the present units and the ancillaries, and the other in which this relationship is relatively weak. No doubt, the degree of closeness varies from unit to unit and ancillary to ancillary. But in general it can be concluded that the attitude displayed by the public sector undertakings is relatively more positive. In addition to the government directive to them for the promotion of ancillaries, the public sector units have also not viewed the ancillaries totally as subcontractors. Barring a few companies, most of the units in the private sector look at ancillaries purely from an economic angle.

For the promotion of ancillaries, the large unit should provide the necessary help on a continuing basis until such time that the small units are able to stand on their own and emerge as independent units. The more positive parent units have established liaison calls to maintain day-to-day dialogue with ancillaries besides rendering reasonable technical assistance. The linkage has to be strong in the initial phase; the large units must try to help the small ones to procure loans from state-run institutions, and must also take steps to get some kind of moratorium during a period of recession.

For example, one parent enterprise covered 50% of the value of rejected raw materials of its ancillary enterprises during the first month, 25% during the second, and from the third month onward the entrepreneur was expected to take full financial responsibilities for the rejections. The assistance rendered has even been extended to the maintenance of accounts and ledgers and the drawing up of balance sheets.

There is a false notion among the ancillaries that their economy in production is essentially due to low wages. The high overheads in large enterprises arise from expenditures on production planning, production controls, accounting, inventory, general administration and a certain loss of productivity on account of a reallocation of workers to different jobs. In the ancillary units, however, the entrepreneur himself takes up most of the production planning, controls, and accounting, thereby reducing overheads. Because of the repetitive nature of the job, there would also be a saving on loss of productivity. Thus, there is no justification for the relatively low wage structure that exists in the ancillaries and that has led to the migration of workers from the ancillaries to the bigger units.

At many a critical time, the small units face the problem of procuring imported



raw materials and also scarce local inputs. Help rendered by some parent units in assisting the ancillaries to get material of quality in time to meet their orders is a welcome feature. However, in the long run, a cooperative venture within the ancillaries for material procurement appears to be the right approach.

Most of the ancillaries could earn a profit of 15% to 25% on their capital from their second or third year of operation. Most of the parent units have provisions for renegotiating the prices on the supplies from ancillaries. For example, one large parent firm has a pricing committee, consisting of the project engineer (ancillary industries) and other senior officials, for negotiation and for establishing the rates for various categories of orders. The public sector units make 90% payment on delivery, whereas ancillaries in the private sector use bill-discounting facilities from the banks.

The provision of common developmental and testing facilities, exhibition of new developments and prototype models, an organized facility to help in the procurement of imported materials, the institution of effective entrepreneurial and reorientation courses, and incentives for innovation were suggested by entrepreneurs for the promotion of the ancillary industries and the small-scale sector in general. In their view, a sure way to develop ancillary units is to give them secure orders and help them consolidate in manufacturing processes one by one. This would breed confidence and encourage entrepreneurial talent.

Eventually, the general emphasis on aid to small-scale industries should be switched away from giving preferences, subsidies, and special protections, to measures that remove the disabilities of small firms and give them a fair chance to compete. The national interest would be best served by the establishment of an organic link between the large and small firms, which could lead to the modernization and health of the small-scale sector.

Table 1: Programed Investment Per Mexican Employed in 728  
Exemption Applications Under DDDI\*

	Zone II**	Zone III**
a. Programed Investment (millions of pesos)	1,640	21,075
b. Manpower	6,066	42,545
c. a/b	270,359	495,357
Number of Applications	126	602

\*Figures until September 1975.

\*\*See preceding text for a description of the zones.

Table 2: Industrial Production by Priorities 1970-1975.

	1970	1972	1975*
First Priority	21.2	22.3	22.0
Second Priority	70.2	67.5	67.3
Third Priority	5.3	7.0	7.6
Nonpriority	3.3	3.2	3.1
Total	100.0	100.0	100.0

\*Estimate

Table 3: Production of the 200 Largest Manufacturing Firms  
(percentage of the gross annual production  
of the 200 firms).

	1964	1973
	%	%
First Priority	38.4	33.3
Second Priority	53.0	59.6
Third Priority	5.8	5.3
Nonpriority	2.8	1.8
Total	100.0	100.0

Table 4: Composition of the Public Gross Fixed Investment (GFI) by Sectors.  
(in percentages)

	1968	1969	1970	1971	1972	1973	1974	1975	1976*	1977**
Agriculture	7.2	6.0	7.7	7.6	10.2	14.3	15.9	15.5	13.3	12.5
Fishing	-	-	1.4	1.4	3.1	1.5	6.7	2.7	1.2	3.1
Mining	1.3	0.7	0.3	1.9	2.5	5.8	8.8	7.5	5.7	11.5
Oil	2.3	6.1	6.1	10.9	8.1	20.1	17.9	43.5	38.0	14.6
Electricity	11.3	12.4	15.1	16.8	16.0	11.7	5.1	4.4	5.9	11.9
Industry	2.5	2.8	4.2	1.7	2.2	2.6	4.2	4.9	10.8	7.1
Building	13.7	8.3	11.2	5.3	7.6	4.5	3.9	1.6	0.1	3.2
Transport & Communications	40.2	25.3	35.7	17.2	15.8	13.1	14.4	7.6	9.6	18.5
Education & Health	6.2	6.4	6.1	3.9	6.1	5.1	5.5	3.6	6.7	9.2
Other	15.2	13.0	12.3	33.3	28.4	21.1	17.5	5.4	7.9	8.4
Public GFI:										
Total GFI	30.1	35.1	37.7	33.7	38.4	39.6	45.5	47.1	4.7	S.D.

\* INP Estimate

\*\*Calculated in November 1976

Source: Datos INP

Table 5: Ratio Between Gross Production Value (GPV) and Employment for Public Projects Programmed or Being Implemented in 1977.

Sector	GPV/Employment Ratio*
Manufacturing Industries	3.063
Food Industries	0.244
Capital Goods	4.239
Basic Industrial Inputs	10.380
Traditional Exports	30.740
Nontraditional Exports	0.232

\*GPV in thousands of dollars. Employment in number of people.

Table 6: Private and State-Owned Companies According to Their Participation in Technological Research Projects Authorized by ITINTEC in 1975.

	Date of Agreement	Value of the Project	
		S/'000	%
I <u>State Companies</u>			
A. <u>Cement Industry</u>			
- Cementos Lima	27-08-75	1,877	
- Cemento Andina	05-11-75	2,444	
		4,321	4.6
B. <u>Paper Industry</u>			
- Paramonga, TRUPAL, San Marti, Cartavio	12-12-75	8,522	
- Paramonga, TRUPAL, San Marti, Cartavio	12-12-75	6,374	
		14,896	15.9
C. <u>Other Industries</u>	12-12-75	3,822	4.1
State Sub-Total		23,039	24.6
II <u>Private Companies</u>			
Private Sub-Total*		70,189	75.4
III <u>Total Industrial Sector</u>		93,228	100.0

\*Includes S/100,000 for a project at Papeles Especiales S.A., a private company.

Source: ITINTEC, Principal aspects of ITINTEC activities related to technology research and transferring technology 1971-1975, April 1976.

Table 7: Private and State-Owned Companies According to Their Participation in Technological Research Projects Authorized by ITINTEC in 1974.

	Date of Agreement	Value of Project	
		S/'000	%
I <u>State Companies</u>			
A. <u>Cement Industries</u>			
- Cemento Norte Pacasmayo S.A.	19-12-74	3,271	2.4
B. <u>SIDERPERU</u>			
- Siderperu	15-01-75	45,000	
- Siderperu	15-01-75	489	
		45,489	32.7
C. <u>Other Industries</u>	12-09-74	516	0.4
State Sub-Total		49,276	35.5
II <u>Private Companies</u>			
A. <u>Paper Industries</u>			
- I.P. Atlas S.A.	17-10-74	1,702	1.2
B. <u>Other Industries</u>		88,038	63.3
Private Sub-Total		89,740	64.5
III Total Industrial Sector		139,016	100.0

Source: ITINTEC, Principal aspects of ITINTEC activities related to technology research and transferring technology 1971-1975, April 1976.

Table 8: Contribution to ITINTEC of the Most Important State-Owned Companies in the Industrial Sector. (2% of their net income) (1974)\*

	S/'000	%
Paper Industry	14,865	34
Cement Industry	7,633	18
SIDERPERU	15,561	36
Others	5,192	12
Total	43,251	100

\*The calculation only includes companies with majority state ownership: thus the contribution of Bayer Industrial was not included (S/5,956,000).

Source: MIT, OSP.

Table 9: Paper Industry: Sources of Raw Materials for 1970.

Raw Material	% of Quantity	% of Value
<u>Imported</u>		
- bleached chemical pulp	8.8	19.6
- unbleached chemical pulp	10.7	22.0
- chips	2.3	3.2
- mechanical wood pulp	0.2	0.4
Total Imported	22.0	45.2
<u>National</u>		
- cellulosic pulp from bagasse	47.0	39.8
- bagasse	3.0	0.1
- chips	28.0	14.2
Total National	78.0	54.1
Total	100.0	99.3

Source: MIT, OSP

## NOTES

- (1) CEPAL-NAFINSA, La política industrial en el desarrollo económico de México, CEPAL/MEM/71/11/Rev. 1, August 1971.
- (2) CEPAL-NAFINSA, op. cit., p. 93.
- (3) The basic industries were those that produced raw materials, capital goods, and equipment (they could receive tax exemptions for up to 10 years); the semibasic industries were those that produced goods that directly provided vital necessities of the population, tools, scientific instruments, or intermediate inputs (they could receive tax exemptions for up to 7 years); the secondary industries were defined by exclusion (and could receive tax exemptions for up to 5 years).
- (4) Other incentives are also granted to enterprises with some capital up to 5 million pesos: technical assessment for the attainment of credit, preinvestment and feasibility studies, process and machinery selection and acquisition.
- (5) The question is valid concerning the functioning of various instruments: fiscal incentives, the fiscal treatment of expenditures on R&D, etc. Regarding the contribution of transnational enterprises to local technological development, see the section on policy instruments for the regulation of technology imports.
- (6) In the case of the authorization for accelerated depreciation of the assets of the enterprise, DDDI may induce speculation with the replacement of machine tools. See the section concerning the coefficients for the depreciation of fixed assets.
- (7) See the Annual Report of the Bank of Mexico for 1970 and 1975 (Statistical Appendix). The concept of industrial production includes mining and the energy sector. For a discussion of the decision-making process in monetary policy in Mexico, see Carlos Bazdresch, La política monetaria mexicana, in Demografía y economía, No. 21, Vol. VII, 1973.
- (8) S. Barrio, The role of banks in the commercialization of technology, STPI Team Report, CONICYT, June 1976.
- (9) Charles Cooper and Phillip Maxwell, Machinery suppliers and the transfer of technology to Latin America, Sussex University, Science Policy Research Unit, 1975.
- (10) F. Sagasti, El financiamiento industrial como instrumento de política tecnológica: un caso estudio peruano, El Trimestre Económico, Vol. XLV, No. 178, April-June 1978, pp. 401-441.
- (11) See ITINTEC, Principal aspects of ITINTEC activities related to technology research and transferring technology 1971-1975, April 1976.
- (12) Regulations regarding R&D expenditures are examined in Module 8.
- (13) See La cuestión de las remesas por asistencia técnica, in Comercio Exterior, Sección Nacional, December 1969.
- (14) This situation could change in the near future. In the Fiscal Reform Project one of the principal justifications given is the necessity of countering the insufficiency of public revenue and its marked dependence on oil revenue.
- (15) It is worth clarifying that in the jurisprudence of the Venezuelan tax system, the expressions "exemption" and "exoneration" are not in any way synonymous. "Exemption...is a right, a privilege which emanates directly from the law. Exoneration on the other hand is no more than an occasional benefit which can be conceded or withheld by the National Executive in accordance with its own criteria. The consequences of the difference between the two categories of exclusion from taxation are very important....The beneficiary of the right to exemption can only be denied

this right on reasoned grounds, since the right to exemption can be the object of a judicial claim by he who believes he holds it....On the other hand, he who aspires to exoneration has to submit himself to the discretionary will of the National Executive." (Junta of Appeals, Sentence No. 497, 8-6-55).

- (16) For a more detailed analysis of the impact of this and other instruments of the policy on engineering, see A. Nadal and M. González Felipe, Las firmas de ingeniería en México, STPI Project, El Colegio de México, mimeo, March 1976.



Appendix 1  
INSTITUTES AND COUNTRIES PARTICIPATING  
IN THE STPI PROJECT

Argentina	Secretaria Ejecutiva del Consejo Latinoamericano de Ciencias Sociales (CLACSO) Country Coordinator: Eduardo Amadeo
Brazil	Financiadora de Estudos e Projetos (FINEP) Country Coordinator: Fabio Erber (until September 1974) and José Tavares
Colombia	Fondo Colombiano de Investigaciones Cientificas y Proyectos Especiales "Francisco José de Caldas" (COLCIENCIAS) Country Coordinator: Fernando Chaparro
Egypt	Academy of Scientific Research and Technology Country Coordinator: Adel Sabet (until July 1975) and Ahmed Gamal Abdel Samie
India	National Committee on Science and Technology Country Coordinator: Anil Malhotra (until June 1975) and S.K. Subramanian (until March 1976)
South Korea	The Korea Advanced Institute of Science (KAIS) Country Coordinator: KunMo Chung
Mexico	El Colegio de Mexico Country Coordinator: Alejandro Nadal
Peru	Instituto Nacional de Planificacion (INP) Country Coordinator: Enrique Estremadoyro (until February 1975) and Fernando Otero Technical Directors: Fernando Gonzales Vigil (until February 1975) and Roberto Wangeman
Venezuela	Consejo Nacional de Investigaciones Cientificas y Tecnologicas (CONICIT) Country Coordinator: Dulce de Uzategui (until July 1974) and Ignacio Avalos
Yugoslavia (Macedonia)	Faculty of Economics, University of Skopje Country Coordinator: Nikola Kljusev

## Appendix 2 SURVEY OF THE COUNTRY TEAM'S WORK

The organization, composition, and orientation of each of the country teams reflected the own interests and those of the institutions that hosted them, always within the framework of the STPI project concerns. A brief review of the approach and the work of each team may help to place the STPI project and the comparative reports in perspective. To complete the survey, a description of the field coordinator's office work is given.

**ARGENTINA:** The initial location for the Argentine team was the Department of Economics of the Catholic University. However, after some months, the university decided to withdraw its application and the country coordinator moved to the Argentine branch of the executive secretariat of the Latin American Social Science Council (CLACSO). The team was headed by Eduardo Amadeo, an economist, and two other members were appointed to work full time on the project. An advisory committee of several researchers and policymakers active in science and technology policy was formed. To carry out the research, the team relied on consultants who wrote reports on specific subjects that were integrated into a final report.

A significant change took place when the country coordinator was named president of the Instituto Nacional de Tecnologia Industrial (INTI), the national industrial technology institute, which is the largest and most important industrial research organization in Argentina. Mr Amadeo never relinquished his formal role as coordinator; after 6 months, he left his new post and resumed his position as country coordinator. Because most of the work was well under way, his absence did not substantially alter the team's pace, although the preparation of the Argentine synthesis report was postponed. Part of the team's work was reoriented to be most useful to the coordinator in his new position.

The Argentines focused on two branches of industry - machine tools and petrochemicals - but studied many broader issues. For instance, the reports include a document on the technological content of the 3-year development plan (1974-77), a study of the Argentine industrial structure, a description and brief analysis of technology policy instruments in Argentina, a study of the system for regulating technology imports, and several short reports on international technical assistance as an instrument of technology policy.

The structure of the Argentine scientific and technological system was studied in detail, as were the conditions under which it could be made more responsive to industry's needs. The Argentines covered the public sector, examining the possible role of the public sector as promoter of scientific and technological development. Detailed studies were carried out at two enterprises: one in charge of generating electricity in Buenos Aires (SEGBA) and the other in charge of generating and distributing gas for household and industrial consumption. Other contributions of the Argentine team were a study of the emergence and development of engineering and consulting firms in the chemical process industries, a detailed analysis of two research centres within the national industrial technology institute (INTI), and two short papers on capital accumulation and on the crisis of capitalism.

The Argentine team followed the methods guidelines; however, they produced a series of thematic reports on issues of actual and potential interest to policymakers in the country, coinciding with the themes selected for study in STPI.

**BRAZIL:** The Brazilian team was hosted at the research group of the Financiadora de Estudos e Projetos (FINEP), the state agency in charge of financing studies for investment projects and also the executive arm of the national fund for scientific and technological development. The first coordinator was the director of the research group,

Fabio Erber. When he took a leave of absence from FINEP in September 1974, he was replaced by José Tavares, the new head of the research group. The group at FINEP had been carrying out research on science and technology policy for some time, and the STPI assignment was one of its tasks for 1973-76. Practically all of the work was done by members of the FINEP research group, although two or three reports were contracted to professionals outside FINEP.

From the beginning, the Brazilians decided to concentrate on the role of state enterprises in technology policy. They chose branches of industry that were dominated by state enterprises (oil and petrochemicals, steel, and electricity), conducting detailed interviews, analyzing existing data, and testing hypotheses systematically to cover issues such as the selection of equipment and processes, the purchase of engineering services, the performance of research and development, and the planning activities at these state enterprises.

In addition to the new material generated by the Brazilian team during STPI, several reports based on past research carried out by FINEP were made available to the STPI network. These included background reports on the organization and structure of the Brazilian science and technology system, a study on the machine tool industry, a report on the demand for services of 12 research institutes, and a background report on industrial policies in Brazil during the last 2 decades.

In parallel with the work for STPI, the FINEP team was also engaged in a research project on the diffusion of technical innovations in three industrial branches (pulp and paper, cement, and textiles) and they agreed to put their results at the disposal of the STPI network as an additional contribution.

The Brazilian team used the guidelines only as a general reference, given that most of their work went along different lines from those originally envisaged for the project. Nevertheless, the richness and variety of their material effectively upgraded the comparative reports.

COLOMBIA: No Colombian participant was present at the initial organizing meeting, and the Colombian application to join the STPI network was received later and formally accepted at the Rio meeting of the coordinating committee. The team was hosted by the Colombian Council for Science and Technology, COLCIENCIAS, and was headed by a sociologist, Fernando Chaparro. In spite of joining the STPI network late, the Colombian team caught up with the pace of work and finished all its work by the deadline.

COLCIENCIAS organized a special team with five members who devoted practically all their time to research in STPI. Several other consultants were also asked to prepare reports on issues of specific interest such as selected policy instruments. For example, a study was commissioned on the impact of tariff mechanisms; a report was prepared on the influence of price controls; and a preliminary analysis of the possible use of the state's purchasing power as an instrument of technology policy was also prepared. The branches chosen for study were all linked to agriculture: fertilizers and pesticides, agricultural machinery, and food processing, taking into consideration the interests of Colombian policymakers as perceived by the team. In these branch studies, the methods guidelines were closely followed.

Other reports prepared by the Colombian team include a study of science and technology planning, an analysis of implicit industrial technology policies, a conceptual framework for the study of consulting and engineering organizations, a series of reports on industrial branches based on discussions with panels of experts, a study of science and technology policies in the agricultural sector (to complement the analysis done for industry), and two essays on the process of industrialization in Colombia and its technological implications.

Five groups of policy instruments were studied in detail, and their impact on each branch was examined through interviews at various enterprises. All of the findings were integrated into the final report of the Colombian team.

EGYPT: Although an Egyptian representative participated in the initial deliberations leading to the STPI project, it was not possible to organize the team to carry out

research and prepare inputs for the international comparison. There were several administrative difficulties and staffing problems that prevented the organization of a working team. The host institution was the Academy of Scientific Research and Technology and the first coordinator was Adel Sabet, who was replaced by Gamal A. Samie in July 1975. The Egyptian team presented papers that were personal contributions based on past experience rather than the result of research carried out by a team; and research was not begun at the academy until the second half of 1976.

INDIA: The host organization in India was the National Committee on Science and Technology, and the first coordinator was Anil Malhotra, who was replaced in June 1975 by S.K. Subramanian. Mr Subramanian resigned in March 1976, and no one replaced him. No funds were requested to set up a country team in India, and the Indians provided background material that had already been collected as background for a new science and technology plan.

Three background documents were distributed along with the final S & T plan to all the teams in STPI. In addition, a report on foreign collaboration, a note on science and technology planning in India, a survey of engineering consultancy services, a report on the development of the electronics industry, and two papers on small-scale industries and technology transfer were distributed by the Indian coordinator. No empirical research was done following the methods guidelines, and the Indian contribution to the comparative reports reflects this.

SOUTH KOREA: The South Korean team was one of the first to be organized and was established at the Korean Advanced Institute of Science, KAIS, as part of the activities of its science, technology, and society program. KunMo Chung was named country coordinator and the team consisted of five other members. All but one of them had other academic duties and could allocate only a portion of their time to STPI research. Then, Graham Jones was hired to advise in the preparation of the report for phase 1.

The South Korean team advanced rapidly and completed its work in time for the Sussex workshop, following the methods guidelines and introducing modifications only where necessary. Two reports were produced corresponding to the requirements for phases 1 and 2 of the project.

The branches chosen for study were electronics, petrochemicals, and powder metallurgy, and a report was prepared for each one. In addition, the team prepared documents on engineering services and industrialization in South Korea, on the Korean Institute of Science and Technology, on transfer of technology in the electronics industry, on the interface between the science and technology plan and the economic development plan, and on state enterprises in technical development.

Although most of the work was done by the team located at KAIS, consultants were asked to deal with specifics. The team predominantly represented engineering and physical sciences, but an economist who was a senior government official, helped to relate the results to South Korean policymakers and to balance the other team members' biases.

MEXICO: The Mexican team was among the first to start working in STPI and was located at El Colegio de Mexico, an academic and social research and graduate training organization. Alejandro Nadal was country coordinator and there were four other members of the team who worked full time on STPI. The Mexican team initially followed the guidelines rather closely and was one of the first in suggesting modifications and changes as a result of contrasting concepts with preliminary research findings. In particular, the team found it difficult to interpret the results of interviews in enterprises using the schema proposed to study technological behaviour. The branches chosen for detailed study were capital goods, food processing, and petrochemicals.

A background report on the structure and evolution of the Mexican scientific and technological system was prepared, together with a description of the industrialization process and of agricultural development. Documents on particular subjects included a report on engineering firms, a study of the technology policy of PEMEX (the state oil monopoly), and progress reports dealing with hypotheses on the impact of policy instruments on technical behaviour at the enterprise level, a description of policy instruments in Mexico, etc.

Most of the findings of the Mexican team were integrated into the main final report, part of which was delivered at the coordinating committee in New Delhi (January 1976) and the rest at the Sussex workshop (June 1976). The work of the Mexican team covered practically all the research topics considered in STPI, and its contribution to the comparative report reflects this. The Mexican report was published in Spanish in 1977 and was awarded second prize in a contest for the best works in economics.

For various reasons, the Mexican team chose to limit its direct interaction with policymakers and followed its own research program. Results were made available to policymakers in the form of draft reports, and through the participation of the coordinator in one of the committees established to prepare the Mexican plan for science and technology.

PERU: The Peruvian team was established within the research group of the National Planning Institute. A series of administrative difficulties affected the progress of the team, including a change of technical director, when Fernando Gonzales Vigil was replaced by Roberto Wangeman in February 1975. Approximately two-thirds of the research was completed in time for the Sussex workshop.

From the beginning, the team decided to adopt a sectorial approach to the research. Efforts were focused on the study of industrial branches connected with the extraction and processing of minerals and with the provision of machinery for the mining industry. The steel industry was also studied, with emphasis on the state enterprise in charge of the largest steelworks. This meant that the guidelines were used primarily in sectorial studies and in the analysis of policy instruments.

Background reports on the situation of the scientific and technological system and on the evolution of Peruvian industry were prepared following the general framework put forward in the guidelines. In addition to these and the sectorial reports, the team prepared other documents, dealing with issues such as explicit and implicit science and technology policies, consulting and engineering capabilities, the possible use of state enterprises as instruments of technology, and the government administrative machinery for science and technology policy.

The Peruvian team was located within an official government organization, but its direct impact on policymaking is difficult to assess because it took the form of daily contact with government officials. On the basis of the sectorial reports on mining, a committee has been set up to review the findings of the STPI team.

VENEZUELA: The Venezuelan team was hosted by the national council of science and technology (CONICIT) and was among the first to start working. The team was initially dominated by sociologists, although economists increased their participation at later stages. The first coordinator, Dulce de Uzategui, was replaced by Luis Matos, who was soon followed by Ignacio Avalos. Three other members worked full time, and the team was biased toward sociology and economics.

They progressed through two stages punctuated by a change in government. In the first stage, most of the background reports corresponding to phases 1 and 2 of the STPI methods were prepared, covering the science and technology, the political, the educational, and the economic systems. These reports were made obsolete by the change in government. In the second stage, the team tried to adjust to the new situation, repeating some of the earlier studies and continuing the research. However, the organization of a national congress on science and technology, which mobilized all the staff working at CONICIT, affected the team's progress.

The branches chosen for study were capital goods, electronics, and petrochemicals. In addition, reports were written on specific issues such as the government organizational structure for science and technology policy, instruments for industrial science and technology policy, economic and financial policy instruments and their impact on technology, the purchase of capital goods in two industrial branches, and the relations between the financial system and technology policy. The Venezuelan team concluded its research shortly after the Sussex workshop.

The fact that the Venezuelan team was located in a government agency that took

a very active role in science and technology policy after the change in government created both opportunities and problems. As a result of the new tasks undertaken by CONICIT, the pace and continuity of the STPI work was frequently altered. On the other hand, there was more possibility for actively contributing to policymaking. The Venezuelan contribution to the comparative reports reflects this situation.

YUGOSLAVIA (MACEDONIA): The Macedonian team was organized at the faculty of economics of the University of Skopje. A senior faculty member, Nikola Kljusev, was appointed coordinator. The team was composed of a very large number of faculty members and researchers who devoted part of their time to STPI. The tasks were subdivided and individual reports requested from various members of the team, although at a later stage two team members were asked to work full time on STPI.

The Macedonian team did not follow the guidelines, except in the preparation of a background report for phase 1. Individual reports were submitted on issues of interest to the STPI network, covering topics such as the problems of research and development in industrial enterprises, aspects of science and technology policy in Yugoslavia, the metallurgical industry in Macedonia, and the growth of engineering firms in Yugoslavia.

The Macedonian team's specificity is reflected in their relatively limited contribution to the comparative reports. At any rate, given the high degree of participation of professionals at all levels in policymaking in the Yugoslav self-managed economy, it is rather difficult to assess their contribution toward policymaking in conventional terms.

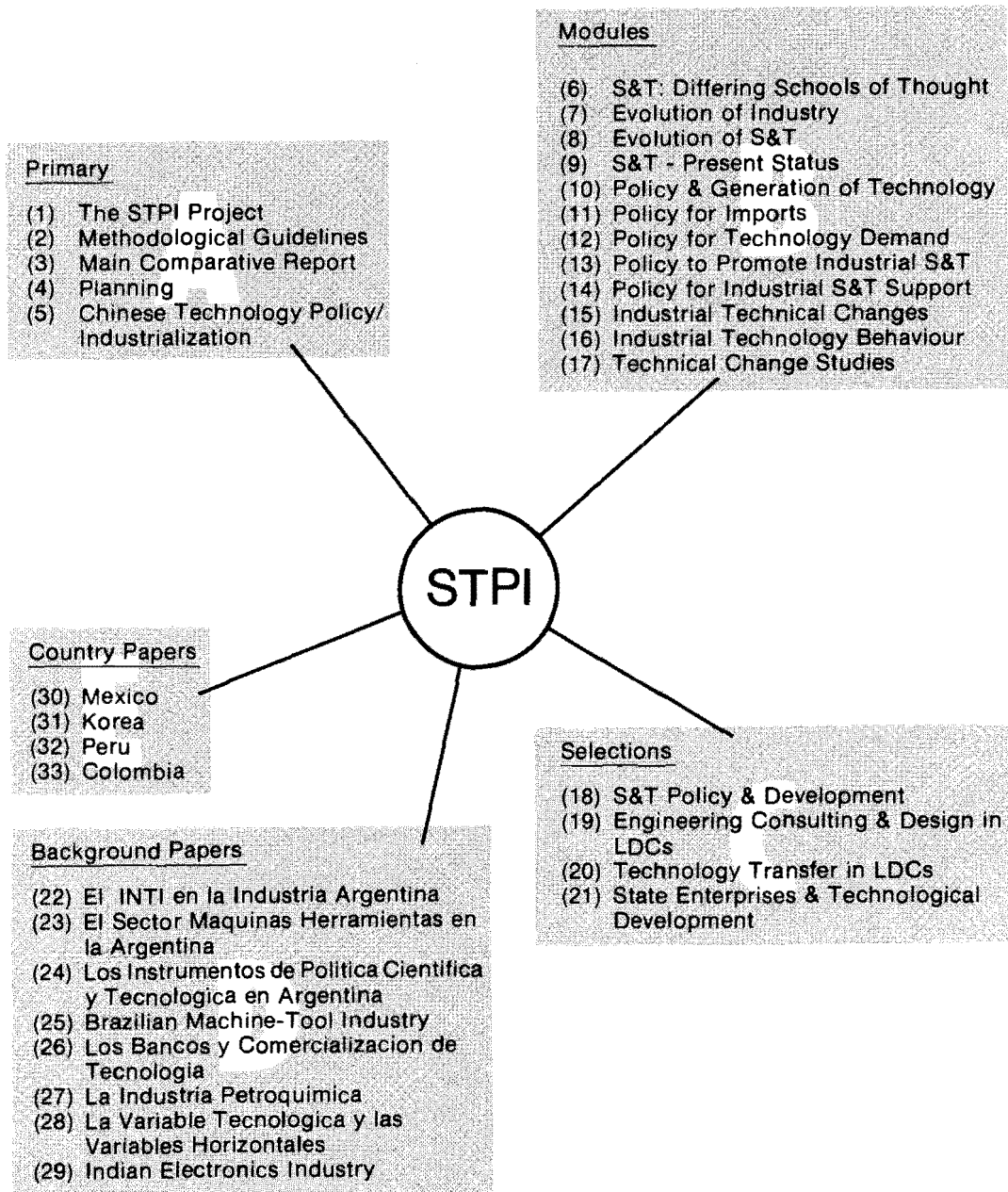
THE FIELD COORDINATOR'S OFFICE: In August 1973, at the first meeting of the coordinating committee, Francisco Sagasti was appointed field coordinator of the project and his office was established shortly thereafter and began operating in a limited way. Staffing was completed in April 1974 with the addition of two members.

The field coordinator's office was independent from the teams and was not engaged directly in empirical research. It offered organizational and technical support and contracted consultants to prepare reports on topics defined by the coordinating committee.

The field coordinator, first, drew up methods guidelines for phases 1 and 2 of the project. Background reports on technology policy in China, on technological dependence/self-reliance, on science and technology planning, on technology policies in Japan, and on technology transfer were also prepared, either by staff members of the field coordinator's office or by consultants. The guidelines for phases 3 and 4 of the project were prepared jointly by the field coordinator and a consultant. The office also organized the Sussex workshop and drafted the comparative reports. The field coordinator was also active in the board of the Peruvian Industrial Technology Institute (ITINTEC).

With the exception of the teams that were engaged in science and technology policy research as part of the activities of their institutions (the Brazilian and South Korean teams, for example), the teams were dismantled after the STPI project was completed. The field coordinator's office was closed in December 1976, and the comparative reports were prepared during 1977-1978, although some teams had not finished their work by April 1978. Even though most teams had concluded their STPI activities by the end of 1977, this does not mean that the team members left the field of S & T policy research and that their effort in STPI was not followed up. What was dismantled, as planned from the beginning, was the formal structure of the STPI project. The network of personal contacts remains in operation and most of the former team members are active in the field of science and technology policy, carrying the experience accumulated in STPI to their new positions.

## Key to STPI Publications



# **A GUIDE TO THE SCIENCE AND TECHNOLOGY POLICY INSTRUMENTS (STPI) PUBLICATIONS**

## **A. Primary Publications**

- (1) The Science and Technology Policy Instruments (STPI) Project (IDRC-050e) (out of print)
- (2) Science and Technology Policy Implementation in Less-Developed Countries: Methodological Guidelines for the STPI Project (IDRC-067e) (out of print)
- (3) Science and Technology for Development: Main Comparative Report of the STPI Project (IDRC-109e). (Also available in French (IDRC-109f) and Spanish (IDRC-109s).)
- (4) Science and Technology for Development: Planning in STPI Countries (IDRC-133e)
- (5) Science and Technology for Development: Technology Policy and Industrialization in the People's Republic of China (IDRC-130e)

## **B. Modules**

These constitute the third part of (3) above and provide supporting material for the findings described and the assertions made in (3).

- (6) STPI Module 1: A Review of Schools of Thought on Science, Technology, Development, and Technical Change (IDRC-TS18e)
- (7) STPI Module 2: The Evolution of Industry in STPI Countries (IDRC-TS19e)
- (8) STPI Module 3: The Evolution of Science and Technology in STPI Countries (IDRC-TS20e)
- (9) STPI Module 4: The Present Situation of Science and Technology in the STPI Countries (IDRC-TS22e)
- (10) STPI Module 5: Policy Instruments to Build up an Infrastructure for the Generation of Technology (IDRC-TS26e)
- (11) STPI Module 6: Policy Instruments for the Regulation of Technology Imports (IDRC-TS33e)
- (12) STPI Module 7: Policy Instruments to Define the Pattern of Demand for Technology (IDRC-TS27e)
- (13) STPI Module 8: Policy Instruments to Promote the Performance of S and T Activities in Industrial Enterprises (IDRC-TS28e)
- (14) STPI Module 9: Policy Instruments for the Support of Industrial Science and Technology Activities (IDRC-TS29e)
- (15) STPI Module 10: Technical Changes in Industrial Branches (IDRC-TS31e)
- (16) STPI Module 11: Technology Behaviour of Industrial Enterprises (IDRC-TS32e)
- (17) STPI Module 12: Case Studies on Technical Change (IDRC-TS34e)

## **C. Selections**

These are a selection of the numerous reports prepared for the STPI Project chosen as a representative sample of the various topics covered by the STPI Project in the course of the main research effort on policy design and implementation.

Science and Technology for Development: A Selection of Background Papers for the Main Comparative Report.

- (18) Part A: Science and Technology Policy and Development (IDRC-MR21)
- (19) Part B: Consulting and Design Engineering Capabilities in Developing Countries (IDRC-MR22)
- (20) Part C: Technology Transfer in Developing Countries (IDRC-MR23)
- (21) Part D: State Enterprises and Technological Development (IDRC-MR24)

## **D. Background Papers**

- (22) El INTI y el Desarrollo Tecnológico en la Industria Argentina (In press)
- (23) El Sector Maquinas Herramientas en la Argentina (In press)
- (24) Los Instrumentos de Política Científica y Tecnológica en Argentina (In press)
- (25) The Brazilian Machine-Tool Industry: Patterns of Technological Transfer and the Role of the Government (In press)
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